TCNOpen TRDP Light

V2.0.0

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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 TCN-TRDP2-D-BOM-011-32 TRDP User's Manual

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 wihtin 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.

1.3 Use Cases

The following diagram shows how these pieces of software are interrelated. Single threaded flow:

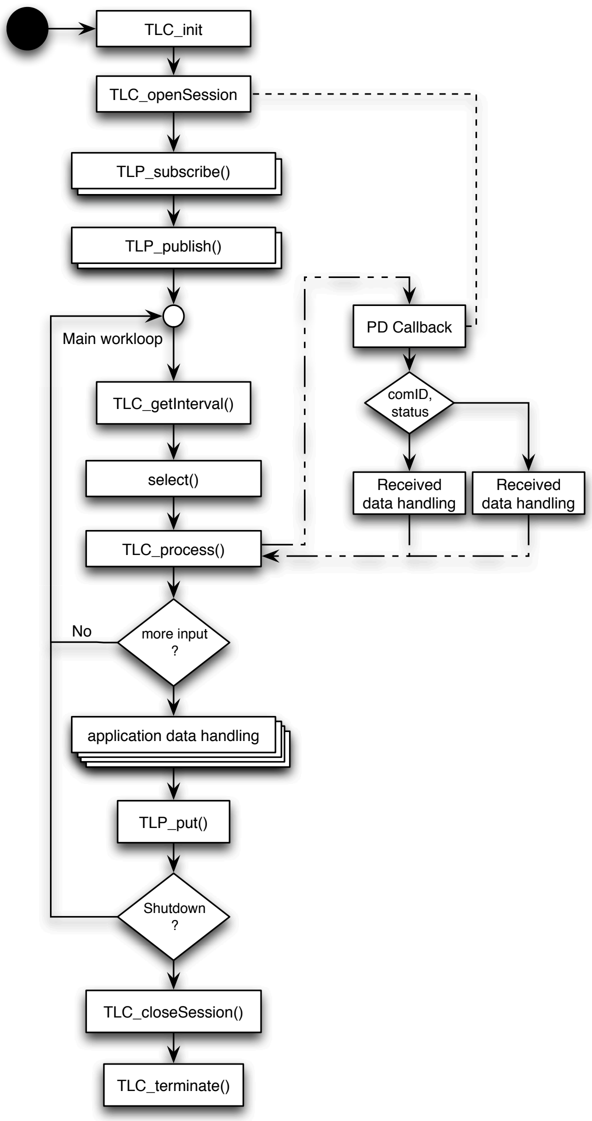

Figure 1.1 Sample client workflow (Single Thread)

Usage of the separate process handling (separate threads for PD and MD):

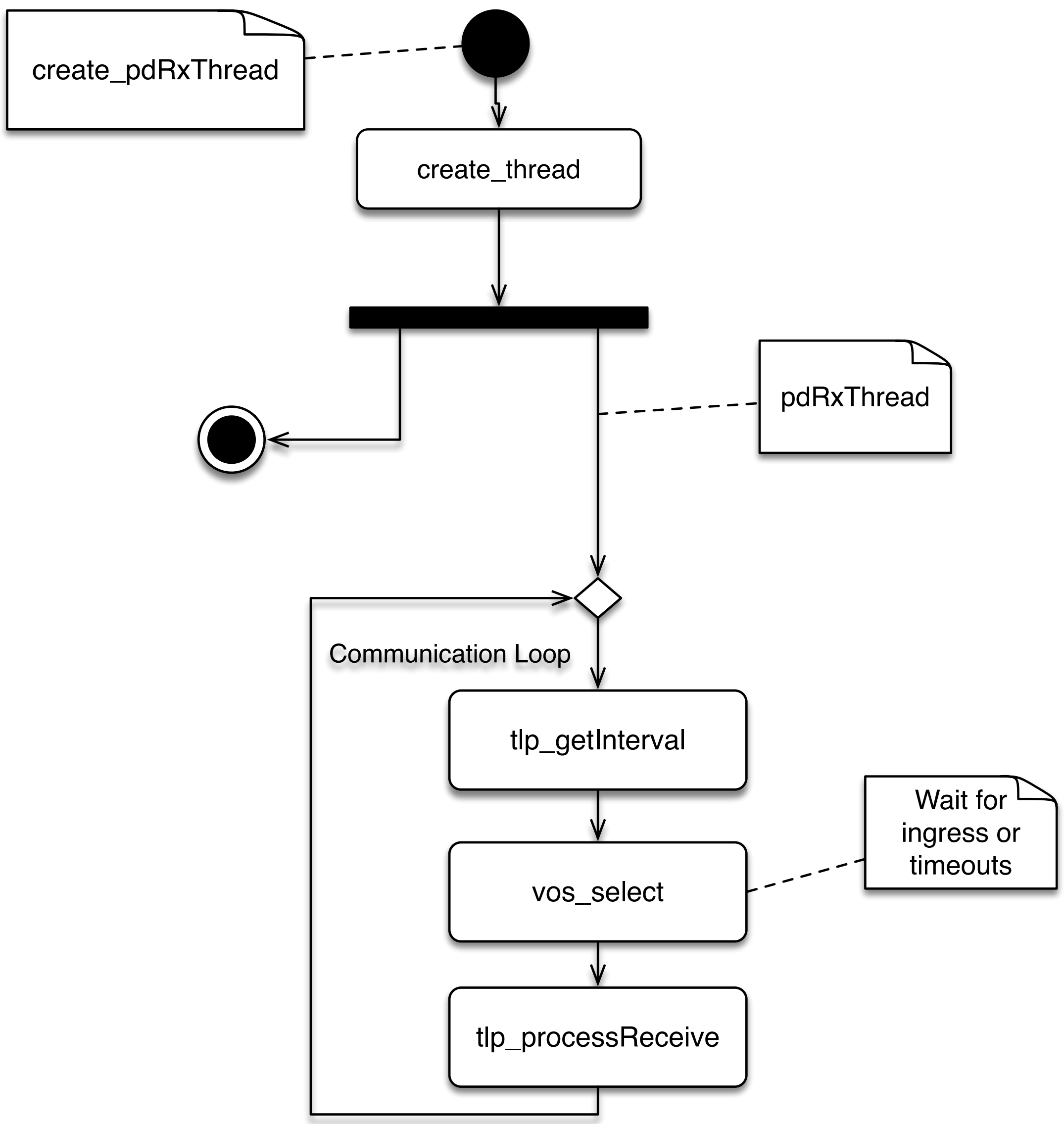

Figure 1.2 Multi-threaded processing of PD Reception

The transmit thread should be a cyclic thread – cycle times down to 1ms are supported:

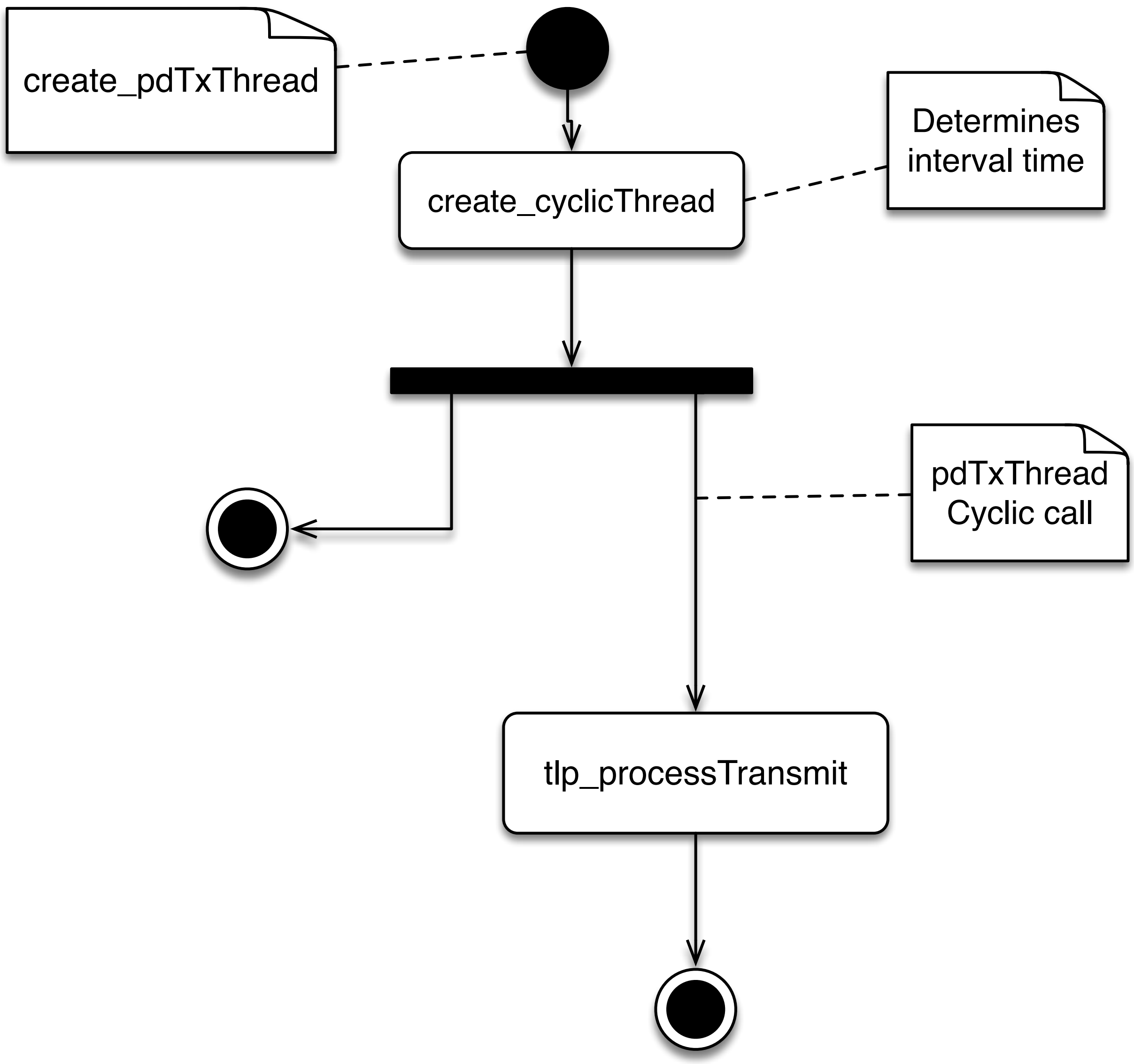

Figure 1.3 Multi-threaded processing of PD Transmit

If Message Data support is needed (MD_SUPPORT=1):

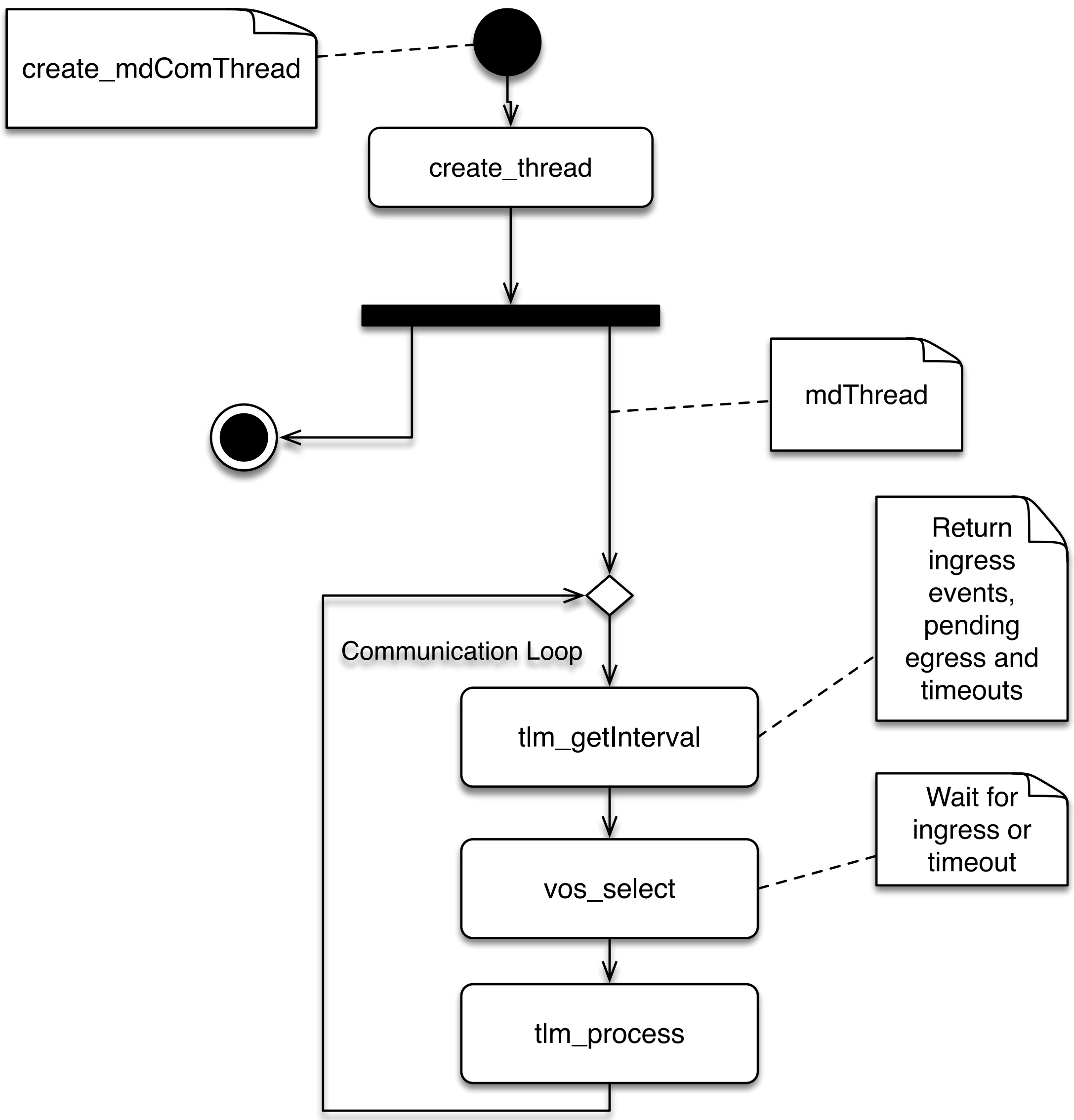

Figure 1.4 Multi-threaded processing of MD

Note: Mixed usage of the single threaded call tlc_process() with the multi-threaded calls tlm_process/tlp_process↩
Transmit/tlp_processReceive is not supported!

1.4 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.

Further description of the API and the usage of the TRDP protocol stack can be found in the TCNOpen TRDP User's Manual (at tcnopen.eu).

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Chapter 4

Data Structure Documentation

4.1 DNS_HEADER Struct Reference

DNS header structure.

4.1.1 Detailed Description

DNS header structure.

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

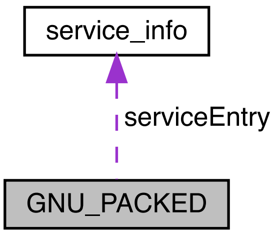
- tau_dnr.c

4.2 GNU_PACKED Struct Reference

Types for ETB control.

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

Collaboration diagram for GNU_PACKED:



Data Fields

- UINT8 trnVehNo

  vehicle sequence number within the train with vehicle 01 being the first vehicle in ETB reference direction 1 as defined in IEC61375-2-5 value range: 0..63 a value of 0 indicates that this vehicle has been inserted by correction
- ANTIVALENT8 isLead

  vehicle is leading
- UINT8 leadDir

  vehicle leading direction 0 = not relevant 1 = leading direction 1 2 = leading direction 2
- UINT8 vehOrient

  vehicle orientation 0 = not known (corrected vehicle) 1 = same as operational train direction 2 = inverse to operational train direction
- TRDP_SHORT_VERSION_T version

  telegram version information, main_version = 1, sub_version = 0
- UINT16 reserved01

  reserved (=0)
- UINT8 trnCstNo

  own TCN consist number (= 1..32)
- UINT8 reserved02

  reserved (=0)
- UINT8 ownOpCstNo

  own operational address (= 1..32) = 0 if unknown (e.g.
- UINT8 reserved03

  reserved (=0)
- UINT32 cstTopoCount

  Consist topology counter.
- UINT32 trnTopoCount

  Train directory topology counter.
- UINT32 opTrnTopoCount

  Operational Train topology counter.
- ANTIVALENT8 wasLead

  consist was leading, '01'B = false, '10'B = true
- ANTIVALENT8 reqLead

  leading request, '01'B = false, '10'B = true
- UINT8 reqLeadDir

  (request) leading direction, '01'B = consist direction 1, '10'B = consist direction 2
- ANTIVALENT8 accLead

  accept remote leading request, '01'B = false/not accepted, '10'B = true/accepted
- ANTIVALENT8 clearConfComp

  clear confirmed composition, '01'B = false, '10'B = true
- ANTIVALENT8 corrRequest

  request confirmation, '01'B = false, '10'B = true
- ANTIVALENT8 corrInfoSet

  correction info set, '01'B = false, '10'B = true
- ANTIVALENT8 compStored

  corrected composition stored, '01'B = false, '10'B = true
- ANTIVALENT8 sleepRequest

  request sleep mode, '01'B = false, '10'B = true
- UINT8 leadVehOfCst

  position of leading vehicle in consist, 0..31 (1: first vehicle in consist in Direction 1, 2: second vehicle, etc.)
- UINT8 reserved04

reserved (=0)

- UINT16 reserved05

  reserved (=0)
- UINT8 reserved06

  reserved (=0)
- UINT8 confVehCnt

  number of confirmed vehicles in train (1..63)
- TRDP_CONF_VEHICLE_T confVehList [TRDP_MAX_VEH_CNT]

  dynamic ordered list of confirmed vehicles in train, starting with vehicle at train head, see sub-clause 5.3.3.2.6
- TRDP_ETB_CTRL_VDP_T safetyTrail

  ETBCTRL-VDP trailer, completely set to 0 == not used.
- UINT8 reserved01

  reserved (=0)
- TRDP_NET_LABEL_T deviceName

  function device of ECSC which sends the telegram
- UINT8 inhibit

  inauguration inhibit 0 = no inhibit request 1 = inhibit request
- UINT8 leadingReq

  leading request 0 = no leading request 1 = leading request
- UINT8 leadingDir

  leading direction 0 = no leading request 1 = leading request direction 1 2 = leading request direction 2
- UINT8 sleepReq

  sleep request 0 = no sleep request 1 = sleep request
- UINT16 lifesign

  wrap-around counter, incremented with each produced datagram.
- UINT8 ecspState

  ECSP state indication 0 = ECSP not operational(initial value) 1 = ECSP in operation.
- UINT8 etbInhibit

  inauguration inhibit indication 0 = n/a (default) 1 = inhibit not requested on ETB 2 = inhibit set on local ETBN 3 = inhibit set on remote ETBN 4 = inhibit set on local and remote ETBN
- UINT8 etbLength

  indicates train lengthening in case train inauguration is inhibit 0 = no lengthening (default) 1 = lengthening detected
- UINT8 etbShort

  indicates train shortening in case train inauguration is inhibit 0 = no shortening (default) 1 = shortening detected
- UINT16 reserved02

  reserved (=0)
- UINT8 etbLeadState

  indication of local consist leadership 5 = consist not leading (initial value) 6 = consist is leading requesting 9 = consist is leading 10 = leading conflict other values are not allowed
- UINT8 etbLeadDir

  direction of the leading end car in the local consist 0 = unknown (default) 1 = TCN direction 1 2 = TCN direction 2 other values are not allowed
- UINT8 ttdbSrvState

  TTDB server state indication 0 = n/a (initial value) 1 = Leader (default) 2 = Follower 3 = Error.
- UINT8 dnsSrvState

  DNS server state indication 0 = n/a (initial value) 1 = Leader (default) 2 = Follower 3 = Error.
- UINT8 trnDirState

  train directory state 1 = UNCONFIRMED 2 = CONFIRMED other values are not allowed
- UINT8 opTrnDirState

  train directory state 1 = INVALID 2 = VALID 4 = SHARED other values are not allowed
- UINT8 sleepCtrlState

sleep control state (option) 0 = option not available 1 = RegularOperation 2 = WaitForSleepMode 3 = PrepareFor↩ SleepMode

- UINT8 sleepReqCnt

  number of sleep requests (option) value range: 0..63, not used = 0
- UINT32 opTrnTopoCnt

  operational train topology counter
- UINT8 command

  confirmation order 1 = confirmation/correction request 2 = un-confirmation request
- UINT16 confVehCnt

  number of confirmed vehicles in the train (1..63).
- TRDP_OP_VEHICLE_T confVehList [TRDP_MAX_VEH_CNT]

  ordered list of confirmed vehicles in the train, starting with vehicle at train head, see chapter 5.3.3.2.10.
- UINT8 status

  status of storing correction info 0 = correctly stored 1 = not stored
- UINT32 reqSafetyCode

  SC-32 value of the request message.
- UINT8 byPassCtrl

  ETBN bypass control 0 = no action (keep old state) 1 = no bypass 2 = activate bypass.
- UINT8 txCtrl

  ETBN transmission control 0 = no action (keep old state) 1 = activate sending on ETB (default) 2 = stop sending on ETB.
- UINT8 slCtrl

  sleep mode control (option) 0 = no action (keep old state) 1 = deactivate sleep mode 2 = activate sleep mode (line activity sensing)
- UINT8 etbnState

  state indication of the (active) ETBN 0 = ETBN not operational(initial value) 1 = ETBN in operation
- UINT8 etbnInaugState

  ETBN inauguration state as defined in IEC61375-2-5 0 = init 1 = not inaugurated 2 = inaugurated 3 = ready for inauguration.
- UINT8 etbnPosition

  position of the ETBN 0 = unknown (default) 1 = single node 2 = middle node 3 = end node TCN direction 1 4 = end node TCN direction 2
- UINT8 etbnRole

  ETBN node role as defined in IEC61375-2-5 0 = undefined 1 = master (redundancy leader) 2 = backup (redundancy follower) 3 = not redundant.
- BITSET8 etbLineState

  indication of ETB line status (FALSE == not trusted, TRUE == trusted) bit0 = line A ETBN direction 1 bit1 = line B ETBN direction 1 bit2 = line C ETBN direction 1 bit3 = line D ETBN direction 1 bit4 = line A ETBN direction 2 bit5 = line B ETBN direction 2 bit6 = line C ETBN direction 2 bit7 = line D ETBN direction 2
- UINT8 byPassState

  state of bypass function 0 = bypass disabled 1 = bypass enabled
- UINT8 slState

  sleep mode state (option) 0 = no sleep mode 1 = sleep mode active (line activity sensing)
- UINT32 etbTopoCnt

  ETB topography counter.
- TRDP_TRAIN_NET_DIR_T trnNetDir

  dynamic train info
- UINT8 ver

  Version - incremented for incompatible changes.
- UINT8 rel

  Release - incremented for compatible changes.
- UINT32 reserved01

reserved (=0)
- TRDP_SHORT_VERSION_T userDataVersion

  version of the vital ETBCTRL telegram mainVersion = 1, subVersion = 0
- UINT32 safeSeqCount

  safe sequence counter, as defined in B.9
- UINT32 safetyCode

  checksum, as defined in B.9
- TRDP_UUID_T cstUUID

  UUID of the consist, provided by ETBN (TrainNetworkDirectory) Reference to static consist attributes 0 if not available (e.g.
- UINT32 cstTopoCnt

  consist topology counter provided with the CSTINFO 0 if no CSTINFO available
- UINT8 cstOrient

  consist orientation '01'B = same as train direction '10'B = inverse to train direction
- UINT8 cstCnt

  number of consists in train; range: 1..63
- TRDP_CONSIST_T cstList [TRDP_MAX_CST_CNT]

  consist list.
- UINT32 trnTopoCnt

  trnTopoCnt value ctrlType == 0: actual value ctrlType == 1: set to 0
- UINT8 etbId

  identification of the ETB the TTDB is computed for bit0: ETB0 (operational network) bit1: ETB1 (multimedia network) bit2: ETB2 (other network) bit3: ETB3 (other network)
- TRDP_NET_LABEL_T vehId

  Unique vehicle identifier, application defined (e.g.
- UINT8 opVehNo

  operational vehicle sequence number in train value range 1..63
- UINT8 opCstNo

  operational consist number in train (1..63)
- UINT8 opCstOrient

  consist orientation '00'B = not known (corrected vehicle) '01'B = same as operational train direction '10'B = inverse to operational train direction
- TRDP_NET_LABEL_T trnId

  train identifier, application defined (e.g.
- TRDP_NET_LABEL_T trnOperator

  train operator, e.g.
- UINT32 crc

  sc-32 computed over record (seed value: 'FFFFFFFF'H)
- UINT8 opTrnOrient

  operational train orientation '00'B = unknown '01'B = same as train direction '10'B = inverse to train direction
- UINT8 opCstCnt

  number of consists in train (1..63)
- TRDP_OP_CONSIST_T opCstList [TRDP_MAX_CST_CNT]

  operational consist list starting with op.
- UINT8 reserved05

  reserved for future use (= 0)
- UINT8 opVehCnt

  number of vehicles in train (1..63)
- TRDP_OP_VEHICLE_T opVehList [TRDP_MAX_VEH_CNT]

  operational vehicle list starting with op.
- TRDP_OP_TRAIN_DIR_STATE_T state

operational state of the train

- UINT32 cstNetProp

  consist network properties bit0..1: consist orientation bit2..7: 0 bit8..13: ETBN Id bit14..15: 0 bit16..21: subnet Id bit24..29: CN Id bit30..31: 0

- UINT16 entryCnt

  number of entries in train network directory

- TRDP_TRAIN_NET_DIR_ENTRY_T trnNetDir [TRDP_MAX_CST_CNT]

  train network directory

- TRDP_OP_TRAIN_DIR_T opTrnDir

  operational directory

- TRDP_TRAIN_DIR_T trnDir

  train directory

- UINT16 noOfEntries

  number of entries in array

- SRM_SERVICE_INFO_T serviceEntry [1]

  var.

- UINT32 comId

  ComId to request: 35...41.

- 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 blockSize [VOS_MEM_NBLOCKSIZES]

  preallocated memory blocks

- UINT32 usedBlockSize [VOS_MEM_NBLOCKSIZES]

  used memory blocks

- 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
- UINT32 numMissed

  number of packets skipped
- UINT32 defReplyTimeout

  default reply timeout in us for MD
- UINT32 defConfirmTimeout

  default confirm timeout in us for MD
- UINT32 numList

  number of listeners
- UINT32 numNoListener

  number of received MD packets without listener
- UINT32 numReplyTimeout

  number of reply timeouts
- UINT32 numConfirmTimeout

  number of confirm timeouts
- UINT32 version

  TRDP version.
- UINT64 timeStamp

  actual time stamp
- UINT32 upTime

  time in sec since last initialisation
- UINT32 statisticTime

  time in sec since last reset of statistics
- TRDP_NET_LABEL_T hostName

  host name
- TRDP_NET_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
- UINT32 numJoin

  number of joins
- UINT32 numRed

  number of redundancy groups
- TRDP_MEM_STATISTICS_T mem

  memory statistics
- TRDP_PD_STATISTICS_T pd

  pd statistics

- TRDP_MD_STATISTICS_T udpMd

  UDP md statistics.
- TRDP_MD_STATISTICS_T tcpMd

  TCP md statistics.
- 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

  call back function if used
- UINT32 userRef

  User reference if used.
- UINT32 timeout

  Time-out value in us.
- UINT32 status

  Receive status information TRDP_NO_ERR, TRDP_TIMEOUT_ERR.
- UINT32 toBehav

  Behavior at time-out.
- UINT32 numRecv

  Number of packets received for this subscription.
- 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.
- CHAR8 uri [32]

  URI user part to listen to.
- UINT32 queue

  Queue reference if used.
- UINT32 id

  Redundant Id.
- UINT32 state

  Redundant state.Leader or Follower.
- 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 datasetLength

  length of the data to transmit 0...1432
- UINT32 reserved

  reserved for ServiceID/InstanceID support
- UINT32 replyComId

  used in PD request
- UINT32 replyIpAddress

used for PD request

- UINT32 frameCheckSum

  CRC32 of header.
- INT32 replyStatus

  0 = OK
- UINT8 sessionID [16u]

  UUID as a byte stream.
- UINT32 replyTimeout

  in us
- UINT8 sourceURI [32u]

  User part of URI.
- UINT8 destinationURI [32u]

  User part of URI.
- PD_HEADER_T frameHead

  Packet header in network byte order.
- UINT8 data [TRDP_MAX_PD_DATA_SIZE]

  data ready to be sent or received

4.2.1 Detailed Description

Types for ETB control.

TRDP PD packet.

TRDP message data header - network order and alignment.

TRDP process data header - network order and alignment.

A table containing PD redundant group information.

Information about a particular MD listener.

Table containing particular PD publishing information.

Table containing particular PD subscription information.

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

Structure containing all general MD statistics information.

Structure containing all general PD statistics information.

Structure containing all general memory statistics information.

TRDP statistics type definitions.

Complete TTDB structure.

Train network directory structure.

Train network directory entry structure acc.

Operational Train directory status info structure.

Operational train structure.

Operational train directory state.

Operational consist structure.

Operational vehicle structure.

TCN train directory.

CSTINFO Control telegram.

TCN consist structure.

Version information for communication buffers.

to IEC61375-2-5

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?, timout, toBehavior, 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 usageStructure containing comId for MD statistics request (ComId 32).

4.2.2 Field Documentation

4.2.2.1 callBack

```
UINT32 GNU_PACKED::callBack
```

call back function if used

Call back function if used.

4.2.2.2 comId

```
UINT32 GNU_PACKED::comId
```

ComId to request: 35...41.

set by user: unique id

ComId to listen to.

Published ComId.

Subscribed ComId.

4.2.2.3 confVehCnt

```
UINT16 GNU_PACKED::confVehCnt
```

number of confirmed vehicles in the train (1..63).

4.2.2.4 confVehList

```
TRDP_OP_VEHICLE_T GNU_PACKED::confVehList[TRDP_MAX_VEH_CNT]
```

ordered list of confirmed vehicles in the train, starting with vehicle at train head, see chapter 5.3.3.2.10.

Parameters 'isLead' and 'leadDir' to be set to 0

4.2.2.5 cstList

```
TRDP_CONSIST_T GNU_PACKED::cstList
```

consist list.

consist list ordered list starting with trnCstNo == 1 Note: This is a variable size array, only opCstCnt array elements are present on the network and for crc computation

If trnCstNo $>$ 0 this shall be an ordered list starting with trnCstNo == 1 (exactly the same as in structure TRAIN↩ _DIRECTORY). If trnCstNo == 0 it is not mandatory to list all consists (only consists which should send CSTINFO telegram). The parameters 'trnCstNo' and 'cstOrient' are optional and can be set to 0.

4.2.2.6 cstUUID

```
TRDP_UUID_T GNU_PACKED::cstUUID
```

UUID of the consist, provided by ETBN (TrainNetworkDirectory) Reference to static consist attributes 0 if not available (e.g.

unique consist identifier

Reference to static consist attributes, 0 if not available (e.g.

correction)

4.2.2.7 datasetLength

```
UINT32 GNU_PACKED::datasetLength
```

length of the data to transmit 0...1432

defined by user: length of data to transmit

4.2.2.8 defQos

`UINT32 GNU_PACKED::defQos`

default QoS for PD

default QoS for MD

4.2.2.9 defTtl

`UINT32 GNU_PACKED::defTtl`

default TTL for PD

default TTL for MD

4.2.2.10 destAddr

`TRDP_IP_ADDR_T GNU_PACKED::destAddr`

IP address of destination for this publishing.

4.2.2.11 deviceName

`TRDP_NET_LABEL_T GNU_PACKED::deviceName`

function device of ECSC which sends the telegram

function device of ED which sends the telegram

4.2.2.12 etbId

`UINT8 GNU_PACKED::etbId`

identification of the ETB the TTDB is computed for bit0: ETB0 (operational network) bit1: ETB1 (multimedia network) bit2: ETB2 (other network) bit3: ETB3 (other network)

identification of the ETB the TTDB is computed for 0: ETB0 (operational network) 1: ETB1 (multimedia network) 2: ETB2 (other network) 3: ETB3 (other network)

4.2.2.13 etbTopoCnt

`UINT32 GNU_PACKED::etbTopoCnt`

ETB topography counter.

set by user: ETB to use, '0' for consist local traffic

train network directory CRC

4.2.2.14 filterAddr

```
TRDP_IP_ADDR_T GNU_PACKED::filterAddr
```

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

4.2.2.15 inhibit

```
UINT8 GNU_PACKED::inhibit
```

inauguration inhibit 0 = no inhibit request 1 = inhibit request

ETBN inhibit 0 = no action (keep old state) 1 = no inhibit request 2 = inhibit request.

4.2.2.16 isLead

```
ANTIVALENT8 GNU_PACKED::isLead
```

vehicle is leading

consist contains leading vehicle, '01'B = false, '10'B = true

4.2.2.17 leadDir

```
UINT8 GNU_PACKED::leadDir
```

vehicle leading direction 0 = not relevant 1 = leading direction 1 2 = leading direction 2

'vehicle leading direction 0 = not relevant 1 = leading direction 1 2 = leading direction 2

4.2.2.18 leadVehOfCst

```
UINT8 GNU_PACKED::leadVehOfCst
```

position of leading vehicle in consist, 0..31 (1: first vehicle in consist in Direction 1, 2: second vehicle, etc.)

position of leading vehicle in consist range 0...32 0 = not defined 1 = first vehicle in consist in direction 1 2 = second vehicle etc.

4.2.2.19 lifesign

```
UINT16 GNU_PACKED::lifesign
```

wrap-around counter, incremented with each produced datagram.

4.2.2.20 msgType

```
UINT16 GNU_PACKED::msgType
```

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

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

4.2.2.21 numCrcErr

```
UINT32 GNU_PACKED::numCrcErr
```

number of received PD packets with CRC err

number of received MD packets with CRC err

4.2.2.22 numMissed

```
UINT32 GNU_PACKED::numMissed
```

number of packets skipped

number of packets skipped for this subscription

4.2.2.23 numProtErr

```
UINT32 GNU_PACKED::numProtErr
```

number of received PD packets with protocol err

number of received MD packets with protocol err

4.2.2.24 numRcv

```
UINT32 GNU_PACKED::numRcv
```

number of received PD packets

number of received MD packets

4.2.2.25 numRecv

```
UINT32 GNU_PACKED::numRecv
```

Number of packets received for this subscription.

Number of received packets.

4.2.2.26 numSend

```
UINT32 GNU_PACKED::numSend
```

number of sent PD packets

Number of packets sent out.

number of sent MD packets

4.2.2.27 numTopoErr

```
UINT32 GNU_PACKED::numTopoErr
```

number of received PD packets with wrong topo count

number of received MD packets with wrong topo count

4.2.2.28 opCstList

```
TRDP_OP_CONSIST_T GNU_PACKED::opCstList[TRDP_MAX_CST_CNT]
```

operational consist list starting with op.

consist #1 Note: This is a variable size array, only opCstCnt array elements are present

4.2.2.29 opTrnDirState

```
UINT8 GNU_PACKED::opTrnDirState
```

train directory state 1 = INVALID 2 = VALID 4 = SHARED other values are not allowed

Operational train directory status: '01'B == invalid, '10'B == valid, '100'B == shared.

4.2.2.30 opTrnTopoCnt

```
UINT32 GNU_PACKED::opTrnTopoCnt
```

operational train topology counter

set by user: direction/side critical, '0' if ignored

operational train topology counter computed as defined in 5.3.3.2.16 (seed value : trnTopoCnt)

operational train topology counter set to 0 if opTrnDirState == invalid

operational train topocounter value of the operational train directory the correction is based on

4.2.2.31 opVehList

`TRDP_OP_VEHICLE_T GNU_PACKED::opVehList[TRDP_MAX_VEH_CNT]`

operational vehicle list starting with op.

vehicle #1 Note: This is a variable size array, only opCstCnt array elements are present

4.2.2.32 ownOpCstNo

`UINT8 GNU_PACKED::ownOpCstNo`

own operational address (= 1..32) = 0 if unknown (e.g.

operational consist number the vehicle belongs to

after Inauguration)

4.2.2.33 protocolVersion

`UINT16 GNU_PACKED::protocolVersion`

fix value for compatibility (set by the API)

fix value for compatibility

4.2.2.34 reserved01 [1/2]

`UINT16 GNU_PACKED::reserved01`

reserved (=0)

reserved for future use (= 0)

4.2.2.35 reserved01 [2/2]

`UINT8 GNU_PACKED::reserved01`

reserved (=0)

reserved for future use (= 0)

4.2.2.36 reserved02 [1/2]

`UINT16 GNU_PACKED::reserved02`

reserved (=0)

reserved (= 0)

reserved for future use (= 0)

4.2.2.37 reserved02 [2/2]

```
UINT16 GNU_PACKED::reserved02
```

reserved (=0)

reserved (= 0)

4.2.2.38 reserved03

```
UINT8 GNU_PACKED::reserved03
```

reserved (=0)

reserved for future use (= 0)

4.2.2.39 reserved04

```
UINT8 GNU_PACKED::reserved04
```

reserved (=0)

reserved for future use (= 0)

4.2.2.40 reserved06

```
UINT8 GNU_PACKED::reserved06
```

reserved (=0)

reserved for future use (= 0)

4.2.2.41 safetyTrail

```
TRDP_ETB_CTRL_VDP_T GNU_PACKED::safetyTrail
```

ETBCTRL-VDP trailer, completely set to 0 == not used.

ETBCTRL-VDP trailer, parameter 'safeSequCount' == 0 completely set to 0 == not used.

ETBCTRL-VDP trailer, parameter 'safeSequCount' == 0 completely set to 0 == SDTv2 not used.

ETBCTRL-VDP trailer, completely set to 0 == SDTv2 not used.

4.2.2.42 serviceEntry

```
SRM_SERVICE_INFO_T GNU_PACKED::serviceEntry[1]
```

var.

number of entries

4.2.2.43 timeout

`UINT32 GNU_PACKED::timeout`

Time-out value in us.

0 = No time-out supervision

4.2.2.44 toBehav

`UINT32 GNU_PACKED::toBehav`

Behavior at time-out.

Set data to zero / keep last value

4.2.2.45 trnCstNo

`UINT8 GNU_PACKED::trnCstNo`

own TCN consist number (= 1..32)

sequence number of consist in train with vehicle 01 being the first vehicle in ETB reference direction 1 as defined in IEC61375-2-5, value range: 1..63, 0 = inserted by correction

train consist number telegram control type 0 = with trnTopoCnt tracking 1 = without trnTopoCnt tracking

Sequence number of consist in train (1..63)

4.2.2.46 trnDirState

`UINT8 GNU_PACKED::trnDirState`

train directory state 1 = UNCONFIRMED 2 = CONFIRMED other values are not allowed

TTDB status: '01'B == unconfirmed, '10'B == confirmed.

4.2.2.47 trnId

`TRDP_NET_LABEL_T GNU_PACKED::trnId`

train identifier, application defined (e.g.

'ICE75', 'IC346'), informal

4.2.2.48 trnNetDir

`TRDP_TRAIN_NET_DIR_T GNU_PACKED::trnNetDir`

dynamic train info

network directory

4.2.2.49 trnOperator

```
TRDP_NET_LABEL_T GNU_PACKED::trnOperator
```

train operator, e.g.

'trenitalia.it', informal

4.2.2.50 trnTopoCnt

```
UINT32 GNU_PACKED::trnTopoCnt
```

trnTopoCnt value ctrlType == 0: actual value ctrlType == 1: set to 0

computed as defined in 5.3.3.2.16 (seed value: etbTopoCnt)

4.2.2.51 trnVehNo

```
UINT8 GNU_PACKED::trnVehNo
```

vehicle sequence number within the train with vehicle 01 being the first vehicle in ETB reference direction 1 as defined in IEC61375-2-5 value range: 0..63 a value of 0 indicates that this vehicle has been inserted by correction

vehicle sequence number within the train with vehicle 01 being the first vehicle in ETB reference direction 1 as defined in IEC61375-2-5, value range: 1..63, a value of 0 indicates that this vehicle has been inserted by correction

4.2.2.52 vehId

```
TRDP_NET_LABEL_T GNU_PACKED::vehId
```

Unique vehicle identifier, application defined (e.g.

UIC Identifier)

4.2.2.53 vehOrient

```
UINT8 GNU_PACKED::vehOrient
```

vehicle orientation 0 = not known (corrected vehicle) 1 = same as operational train direction 2 = inverse to operational train direction

vehicle orientation, '00'B = not known (corrected vehicle) '01'B = same as operational train direction '10'B = inverse to operational train direction

4.2.2.54 version

```
TRDP_SHORT_VERSION_T GNU_PACKED::version
```

telegram version information, main_version = 1, sub_version = 0

1.0 telegram version

Train info structure version.

TrainDirectoryState data structure version.

TrainDirectory data structure version.

Consist Info Control structure version parameter 'mainVersion' shall be set to 1.

parameter 'mainVersion' shall be set to 1.

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

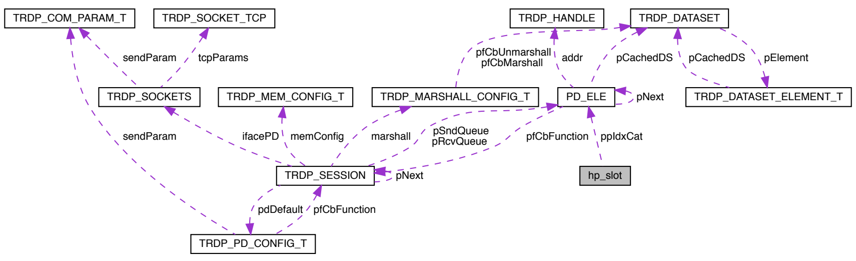
- tau_ctrl_types.h
- tau_tti_types.h
- trdp_serviceRegistry.h
- trdp_types.h
- trdp_private.h

4.3 hp_slot Struct Reference

Low cycle-time slots.

```
#include <trdp_pdindex.h>
```

Collaboration diagram for hp_slot:



Data Fields

- UINT32 slotCycle

  cycle time with which each slot will be called (us)
- UINT8 noOfTxEntries

  no of slots == first array dimension
- UINT8 depthOfTxEntries

  depth of slots == second array dimension
- const PD_ELE_T ∗∗ ppIdxCat

  pointer to an array of PD_ELE_T∗ (dim[depth][slot])

4.3.1 Detailed Description

Low cycle-time slots.

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

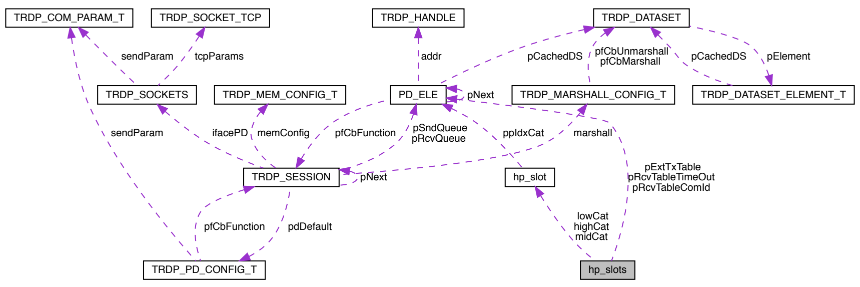
- trdp_pdindex.h

4.4 hp_slots Struct Reference

entry for the application session

```
#include <trdp_pdindex.h>
```

Collaboration diagram for hp_slots:



Data Fields

- UINT32 processCycle

  system cycle time with which lowest array will be called
- UINT32 currentCycle

  the current cycle of the send loop
- TRDP_HP_CAT_SLOT_T lowCat

  array dim[slot][depth]
- TRDP_HP_CAT_SLOT_T midCat

  array dim[slot][depth]
- TRDP_HP_CAT_SLOT_T highCat

  array dim[slot][depth]
- UINT32 noOfRxEntries

  number of subscribed PDs to be handled
- PD_ELE_T ** pRcvTableComId

  Pointer to sorted array of PDs to be handled.
- PD_ELE_T ** pRcvTableTimeOut

  Pointer to sorted array of PDs to be handled.
- UINT8 noOfExtTxEntries

  number of 'special' PDs to be handled
- PD_ELE_T ** pExtTxTable

  Pointer to array of PDs to be handled.

4.4.1 Detailed Description

entry for the application session

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

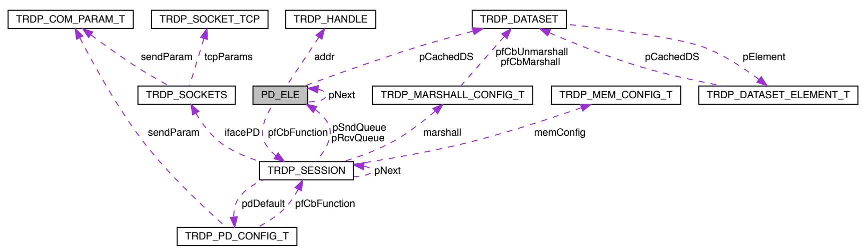
- trdp_pdindex.h

4.5 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
- UINT32 magic

  prevent acces through dangeling pointer
- TRDP_ADDRESSES_T addr

  handle of publisher/subscriber
- TRDP_IP_ADDR_T lastSrcIP

  last source IP a subscribed packet was received from
- TRDP_IP_ADDR_T pullIpAddress

  In case of pulling a PD this is the requested Ip.
- UINT32 redId

  Redundancy group ID or zero.
- UINT32 curSeqCnt

  the last sent or received sequence counter
- UINT32 curSeqCnt4Pull

  the last sent sequence counter for PULL
- TRDP_SEQ_CNT_LIST_T ∗ pSeqCntList

  pointer to list of received sequence numbers per comId
- UINT32 numRxTx

  Counter for received packets (statistics)

- UINT32 updPkts

  Counter for updated packets (statistics)
- UINT32 getPkts

  Counter for read packets (statistics)
- UINT32 numMissed

  Counter for skipped sequence number (statistics)
- TRDP_ERR_T lastErr

  Last error (timeout)
- 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
- TRDP_TO_BEHAVIOR_T toBehavior

  timeout behavior for packets
- UINT32 dataSize

  net data size
- UINT32 grossSize

  complete packet size (header, data)
- UINT32 sendSize

  data size sent out
- TRDP_DATASET_T ∗ pCachedDS

  Pointer to dataset element if known.
- INT32 socketIdx

  index into the socket list
- const void ∗ pUserRef

  from subscribe()
- TRDP_PD_CALLBACK_T pfCbFunction

  Pointer to PD callback function.
- PD_PACKET_T ∗ pFrame

  header ...

4.5.1 Detailed Description

Queue element for PD packets to send or receive.

4.5.2 Field Documentation

4.5.2.1 pFrame

```
PD_PACKET_T* PD_ELE::pFrame
```

header ...

data + FCS...

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

- trdp_private.h

4.6 service_info Struct Reference

Preliminary definition of a service info entry.

```
#include <trdp_serviceRegistry.h>
```

Data Fields

- TRDP_NET_LABEL_T srvName
  – *service short name as defined in X*
- UINT32 serviceId
  – *High Byte = serviceInstanceId Low 24 Bits = serviceTypeId*
- TRDP_SHORT_VERSION_T srvVers
  – *service version*
- UINT8 srvFlags
  – *Flags Bit0: 0 = non safety related; 1 = safety related Bit1: 0 = global service 1 = local service Bit3: 0 = complete service list 1 = service list update Bit4: 0 = add service (update only) 1 = delete service (update only) Bit2-7: reserved for future use (= 0)*
- UINT8 reserved01
  – *reserved for future use (= 0)*
- TIMEDATE64 srvTTL
  – *Time to Live (us or ns?)*
- TRDP_NET_LABEL_T fctDev
  – *host identification of the function device the service is located on.*
- UINT8 cstVehNo
  – *sequence number of the vehicle within the consist (1..32)*
- UINT8 reserved02
  – *reserved for future use (= 0)*
- UINT16 reserved03
  – *reserved for future use (= 0)*
- UINT32 addInfo [3]
  – *service specific information*

4.6.1 Detailed Description

Preliminary definition of a service info entry.

4.6.2 Field Documentation

4.6.2.1 fctDev

```
TRDP_NET_LABEL_T service_info::fctDev
```

– host identification of the function device the service is located on.

Defined in IEC 61375-2-3.

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

- trdp_serviceRegistry.h

4.7 srv_info_req Struct Reference

Preliminary definition of a service info request.

```
#include <trdp_serviceRegistry.h>
```

Data Fields

- TRDP_SHORT_VERSION_T version
  – version of the telegram mainVersion = 1 subversion = 0
- UINT16 reserved01
  – reserved for future use (= 0)
- UINT32 trnTopoCnt
  – trnTopoCnt value
- UINT16 reserved02
  – reserved for future use (= 0)
- UINT8 reserved03
  – reserved for future use (= 0)
- UINT8 cstCnt
  – number of consists in list if set to 255 all consists are requested to resend their SRVINFO telegram if set to >0 and <64 only consists with different srvTopoCnt value are requested to resend their SRVINFO telegram
- UINT32 srvTcList [ ]
  – list of srvTopoCnt values obtained from all consists set to 0 if unknown ordered list starting with trnCstNo = 1

4.7.1 Detailed Description

Preliminary definition of a service info request.

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

- trdp_serviceRegistry.h

4.8 TAU_MARSHALL_INFO_T Struct Reference

Marshalling info, used to and from wire.

Data Fields

- INT32 level

  track recursive level
- UINT8 ∗ pSrc

  source pointer
- UINT8 ∗ pSrcEnd

  last source
- UINT8 ∗ pDst

  destination pointer
- UINT8 ∗ pDstEnd

  last destination

4.8.1 Detailed Description

Marshalling info, used to and from wire.

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

- tau_marshall.c

4.9 TCN_URI Struct Reference

TCN-DNS simplified header structures.

```
#include <tau_dnr_types.h>
```

Data Fields

- CHAR8 tcnUriStr [80]

  if != 0 use TCN DNS as resolver
- INT16 resolvState

  on request: reserved (= 0), on reply: -1 unknown, 0 OK
- UINT32 tcnUriIpAddr

  IP address of URI.
- UINT32 tcnUriIpAddr2

  if != 0, end IP address of range

4.9.1 Detailed Description

TCN-DNS simplified header structures.

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

- tau_dnr_types.h

4.10 TRDP_CLTR_CST_INFO_T Struct Reference

Closed train consists information.

```
#include <tau_tti_types.h>
```

Data Fields

- TRDP_UUID_T cltrCstUUID

    closed train consist UUID
- UINT8 cltrCstOrient

    closed train consist orientation '01'B = same as closed train direction '10'B = inverse to closed train direction
- UINT8 cltrCstNo

    sequence number of the consist within the closed train, value range 1..32
- UINT16 reserved01

    reserved for future use (= 0)

4.10.1 Detailed Description

Closed train consists information.

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

- tau_tti_types.h

4.11 TRDP_COM_PARAM_T Struct Reference

Quality/type of service, time to live , no.

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

Data Fields

- UINT8 qos

  Quality of service (default should be 2 for PD and 2 for MD, TSN priority >= 3)
- UINT8 ttl

  Time to live (default should be 64)
- UINT8 retries

  MD Retries from XML file.
- BOOL8 tsn

  if TRUE, do not schedule packet but use TSN socket
- UINT16 vlan

  VLAN Id to be used.

4.11.1 Detailed Description

Quality/type of service, time to live , no.

of retries, TSN flag and VLAN ID

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

- trdp_types.h

4.12 TRDP_COMID_DSID_MAP_T Struct Reference

ComId - data set mapping element definition.

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

Data Fields

- UINT32 comId

  comId
- UINT32 datasetId

  corresponding dataset Id

4.12.1 Detailed Description

ComId - data set mapping element definition.

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

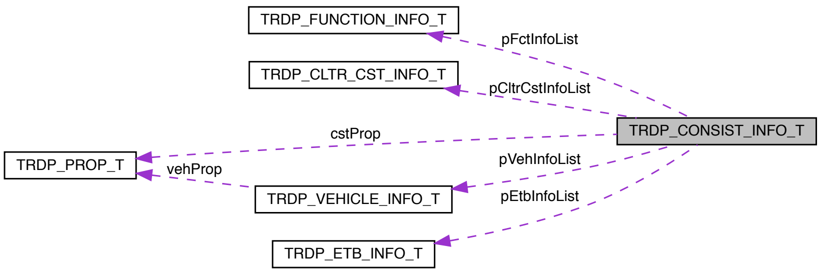
- trdp_types.h

4.13 TRDP_CONSIST_INFO_T Struct Reference

consist information structure

`#include <tau_tti_types.h>`

Collaboration diagram for TRDP_CONSIST_INFO_T:



Data Fields

- TRDP_SHORT_VERSION_T version

  ConsistInfo data structure version, application defined mainVersion = 1, subVersion = 0.
- UINT8 cstClass

  consist info classification 1 = (single) consist 2 = closed train 3 = closed train consist
- UINT8 reserved01

  reserved for future use (= 0)
- TRDP_NET_LABEL_T cstId

  application defined consist identifier, e.g.
- TRDP_NET_LABEL_T cstType

  consist type, application defined
- TRDP_NET_LABEL_T cstOwner

  consist owner, e.g.
- TRDP_UUID_T cstUUID

  consist UUID
- UINT32 reserved02

  reserved for future use (= 0)
- TRDP_PROP_T cstProp

  static consist properties
- UINT16 reserved03

  reserved for future use (= 0)
- UINT16 etbCnt

  number of ETB's, range: 1..4
- TRDP_ETB_INFO_T ∗ pEtbInfoList

  ETB information list for the consist Ordered list starting with lowest etbId.
- UINT16 reserved04

  reserved for future use (= 0)
- UINT16 vehCnt

  number of vehicles in consist 1..32

- TRDP_VEHICLE_INFO_T ∗ pVehInfoList

    vehicle info list for the vehicles in the consist Ordered list starting with cstVehNo==1
- UINT16 reserved05

    reserved for future use (= 0)
- UINT16 fctCnt

    number of consist functions value range 0..1024
- TRDP_FUNCTION_INFO_T ∗ pFctInfoList

    function info list for the functions in consist lexicographical ordered by fctName
- UINT16 reserved06

    reserved for future use (= 0)
- UINT16 cltrCstCnt

    number of original consists in closed train value range: 0..32, 0 = consist is no closed train
- TRDP_CLTR_CST_INFO_T ∗ pCltrCstInfoList

    info on closed train composition Ordered list starting with cltrCstNo == 1
- UINT32 cstTopoCnt

    consist topology counter computed as defined in 5.3.3.2.16, seed value: 'FFFFFFFF'H

4.13.1 Detailed Description

consist information structure

4.13.2 Field Documentation

4.13.2.1 cstId

```
TRDP_NET_LABEL_T TRDP_CONSIST_INFO_T::cstId
```

application defined consist identifier, e.g.

UIC identifier

4.13.2.2 cstOwner

```
TRDP_NET_LABEL_T TRDP_CONSIST_INFO_T::cstOwner
```

consist owner, e.g.

"trenitalia.it", "sncf.fr", "db.de"

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

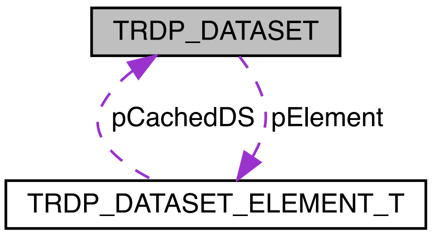
- tau_tti_types.h

4.14 TRDP_DATASET Struct Reference

Dataset definition.

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

Collaboration diagram for TRDP_DATASET:



Data Fields

- UINT32 id

  dataset identifier > 1000
- 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.

4.14.1 Detailed Description

Dataset definition.

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

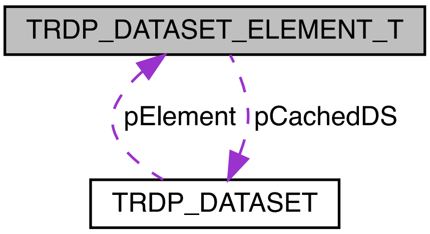
- trdp_types.h

4.15 TRDP_DATASET_ELEMENT_T Struct Reference

Dataset element definition.

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

Collaboration diagram for TRDP_DATASET_ELEMENT_T:



Data Fields

- UINT32 type

  Data type (TRDP_DATA_TYPE_T 1...99) or dataset id > 1000.
- UINT32 size

  Number of items or TRDP_VAR_SIZE (0)
- CHAR8 ∗ name

  Name param, on special request (Ticket #211)
- CHAR8 ∗ unit

  Unit text for visualisation.
- REAL32 scale

  Factor for visualisation.
- INT32 offset

  Offset for visualisation (val = scale ∗ x + offset)
- struct TRDP_DATASET ∗ pCachedDS

  Used internally for marshalling speed-up.

4.15.1 Detailed Description

Dataset element definition.

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

- trdp_types.h

4.16 TRDP_DBG_CONFIG_T Struct Reference

Control for debug output device/file on application level.

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

Data Fields

- TRDP_DBG_OPTION_T option

  Debug printout options for application use.
- UINT32 maxFileSize

  Maximal file size.
- TRDP_FILE_NAME_T fileName

  Debug file name and path.

4.16.1 Detailed Description

Control for debug output device/file on application level.

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

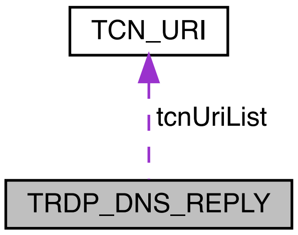
- tau_xml.h

4.17 TRDP_DNS_REPLY Struct Reference

TCN-DNS Reply telegram TCN_DNS_REP_DS.

```
#include <tau_dnr_types.h>
```

Collaboration diagram for TRDP_DNS_REPLY:



Data Fields

- TRDP_SHORT_VERSION_T version

  1.0
- TRDP_NET_LABEL_T deviceName

  function device of ED which sends the telegram
- UINT32 etbTopoCnt

  ETB topography counter.
- UINT32 opTrnTopoCnt

  operational train topography counter needed for TCN-URIs related to the operational train view = 0 if not used
- UINT8 etbId

  identification of the related ETB 0 = ETB0 (operational network) 1 = ETB1 (multimedia network) 2 = ETB2 (other network) 3 = ETB3 (other network) 255 = don't care (for access to local DNS server)
- INT8 dnsStatus

  0 = OK -1 = DNS Server not ready -2 = Inauguration in progress
- UINT8 tcnUriCnt

  number of TCN-URIs to be resolved value range: 0 .
- TCN_URI_T tcnUriList [255]

  defined for max size
- TRDP_ETB_CTRL_VDP_T safetyTrail

  SDT trailer.

4.17.1 Detailed Description

TCN-DNS Reply telegram TCN_DNS_REP_DS.

4.17.2 Field Documentation

4.17.2.1 tcnUriCnt

```
UINT8 TRDP_DNS_REPLY::tcnUriCnt
```

number of TCN-URIs to be resolved value range: 0 .

. 255

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

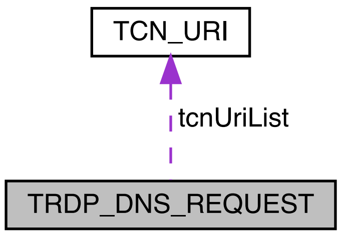
- tau_dnr_types.h

4.18 TRDP_DNS_REQUEST Struct Reference

TCN-DNS Request telegram TCN_DNS_REQ_DS.

```
#include <tau_dnr_types.h>
```

Collaboration diagram for TRDP_DNS_REQUEST:



Data Fields

- TRDP_SHORT_VERSION_T version

  1.0
- TRDP_NET_LABEL_T deviceName

  function device of ED which sends the telegram
- UINT32 etbTopoCnt

  ETB topography counter.
- UINT32 opTrnTopoCnt

  operational train topography counter needed for TCN-URIs related to the operational train view = 0 if not used
- UINT8 etbId

  identification of the related ETB 0 = ETB0 (operational network) 1 = ETB1 (multimedia network) 2 = ETB2 (other network) 3 = ETB3 (other network) 255 = don't care (for access to local DNS server)
- UINT8 tcnUriCnt

  number of TCN-URIs to be resolved value range: 0 .
- TCN_URI_T tcnUriList [255]

  defined for max size
- TRDP_ETB_CTRL_VDP_T safetyTrail

  SDT trailer.

4.18.1 Detailed Description

TCN-DNS Request telegram TCN_DNS_REQ_DS.

4.18.2 Field Documentation

4.18.2.1 tcnUriCnt

```
UINT8 TRDP_DNS_REQUEST::tcnUriCnt
```

number of TCN-URIs to be resolved value range: 0 .

. 255

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

- tau_dnr_types.h

4.19 TRDP_ETB_INFO_T Struct Reference

Types for train configuration information.

```
#include <tau_tti_types.h>
```

Data Fields

- UINT8 etbId

  identification of train backbone; value range: 0..3
- UINT8 cnCnt

  number of CNs within consist connected to this ETB value range 1..16 referring to cnId 0..15 acc.
- UINT16 reserved01

  reserved for future use (= 0)

4.19.1 Detailed Description

Types for train configuration information.

ETB information

4.19.2 Field Documentation

4.19.2.1 cnCnt

```
UINT8 TRDP_ETB_INFO_T::cnCnt
```

number of CNs within consist connected to this ETB value range 1..16 referring to cnId 0..15 acc.

IEC61375-2-5

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

- tau_tti_types.h

4.20 TRDP_FUNCTION_INFO_T Struct Reference

function/device information structure

```
#include <tau_tti_types.h>
```

Data Fields

- TRDP_NET_LABEL_T fctName

  function device or group label
- UINT16 fctId

  host identification of the function device or group as defined in IEC 61375-2-5, application defined.
- BOOL8 grp

  is a function group and will be resolved as IP multicast address
- UINT8 reserved01

  reserved for future use (= 0)
- UINT8 cstVehNo

  Sequence number of the vehicle in the consist the function belongs to.
- UINT8 etbId

  number of connected train backbone.
- UINT8 cnId

  identifier of connected consist network in the consist, related to the etbId.
- UINT8 reserved02

  reserved for future use (= 0)

4.20.1 Detailed Description

function/device information structure

4.20.2 Field Documentation

4.20.2.1 cnId

```
UINT8 TRDP_FUNCTION_INFO_T::cnId
```

identifier of connected consist network in the consist, related to the etbId.

Value range: 0..31

4.20.2.2 cstVehNo

```
UINT8 TRDP_FUNCTION_INFO_T::cstVehNo
```

Sequence number of the vehicle in the consist the function belongs to.

Value range: 1..16, 0 = not defined

4.20.2.3 etbId

```
UINT8 TRDP_FUNCTION_INFO_T::etbId
```

number of connected train backbone.

Value range: 0..3

4.20.2.4 fctId

```
UINT16 TRDP_FUNCTION_INFO_T::fctId
```

host identification of the function device or group as defined in IEC 61375-2-5, application defined.

Value range: 1..16383 (device), 256..16383 (group)

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

- tau_tti_types.h

4.21 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/MD
- TRDP_IP_ADDR_T srcIpAddr2

  second source IP for PD/MD
- TRDP_IP_ADDR_T destIpAddr

  destination IP for PD
- TRDP_IP_ADDR_T mcGroup

  multicast group to join for PD
- UINT32 etbTopoCnt

  etb topocount belongs to addressing item
- UINT32 opTrnTopoCnt

  opTrn topocount belongs to addressing item
- UINT32 serviceId

  group of services this packet belongs to

4.21.1 Detailed Description

Hidden handle definition, used as unique addressing item.

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

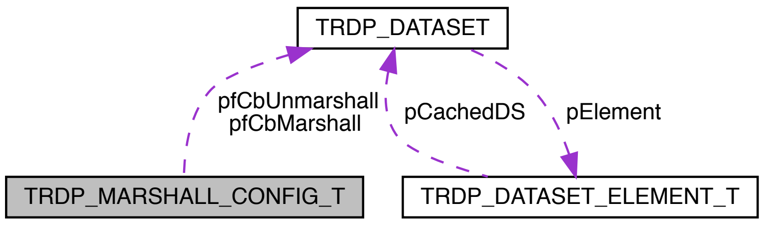
- trdp_private.h

4.22 TRDP_MARSHALL_CONFIG_T Struct Reference

Marshaling/unmarshalling configuration.

`#include <trdp_types.h>`

Collaboration diagram for TRDP_MARSHALL_CONFIG_T:



Data Fields

- TRDP_MARSHALL_T pfCbMarshall

  Pointer to marshall callback function.
- TRDP_UNMARSHALL_T pfCbUnmarshall

  Pointer to unmarshall callback function.
- void $*$ pRefCon

  Pointer to user context for call back.

4.22.1 Detailed Description

Marshaling/unmarshalling configuration.

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

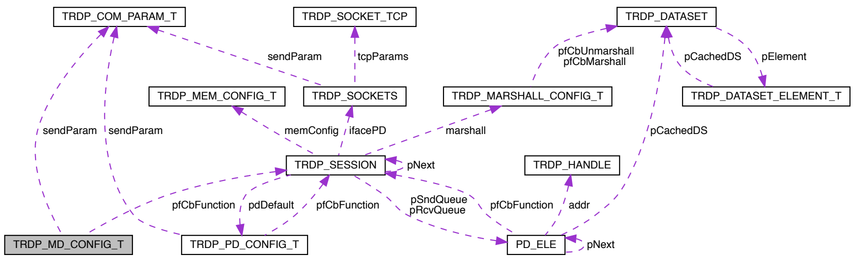
- trdp_types.h

4.23 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 pfCbFunction

    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 reply timeout in us.
- UINT32 confirmTimeout

    Default confirmation timeout in us.
- UINT32 connectTimeout

    Default connection timeout in us.
- UINT32 sendingTimeout

    Default sending timeout in us.
- UINT16 udpPort

    Port to be used for UDP MD communication (default: 17225)
- UINT16 tcpPort

    Port to be used for TCP MD communication (default: 17225)
- UINT32 maxNumSessions

    Maximal number of replier sessions.

4.23.1 Detailed Description

Default MD configuration.

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

- trdp_types.h

4.24 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 etbTopoCnt

  received topocount
- UINT32 opTrnTopoCnt

  received topocount
- BOOL8 aboutToDie

  session is about to die
- UINT32 numRepliesQuery

  number of ReplyQuery received
- UINT32 numConfirmSent

  number of Confirm sent
- UINT32 numConfirmTimeout

  number of Confirm Timeouts (incremented by listeners
- 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 srcUserURI

  source URI user part from MD header
- TRDP_URI_HOST_T srcHostURI

  source URI host part (unused)
- TRDP_URI_USER_T destUserURI

  destination URI user part from MD header
- TRDP_URI_HOST_T destHostURI

  destination URI host part (unused)
- UINT32 numExpReplies

  number of expected replies, 0 if unknown

- UINT32 numReplies

  actual number of replies for the request
- const void ∗ pUserRef

  User reference given with the local call.
- TRDP_ERR_T resultCode

  error code

4.24.1 Detailed Description

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

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

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

- trdp_types.h

4.25 TRDP_MEM_CONFIG_T Struct Reference

Enumeration type for memory pre-fragmentation, reuse of VOS definition.

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

Data Fields

- UINT8 ∗ p

  pointer to static or allocated memory
- UINT32 size

  size of static or allocated memory
- UINT32 prealloc [VOS_MEM_NBLOCKSIZES]

  memory block structure

4.25.1 Detailed Description

Enumeration type for memory pre-fragmentation, reuse of VOS definition.

Structure describing memory (and its pre-fragmentation)

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

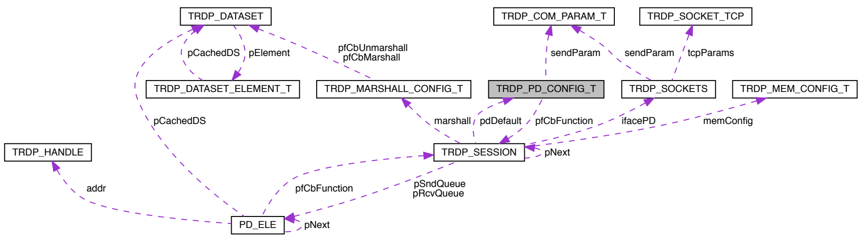
- trdp_types.h

4.26 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 pfCbFunction

  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 behavior.
- UINT16 port

  Port to be used for PD communication (default: 17224)

4.26.1 Detailed Description

Default PD configuration.

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

- trdp_types.h

4.27 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 etbTopoCnt

  received ETB topocount
- UINT32 opTrnTopoCnt

  received operational train directory topocount
- 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
- TRDP_URI_HOST_T srcHostURI

  source URI host part (unused)
- TRDP_URI_HOST_T destHostURI

  destination URI host part (unused)
- TRDP_TO_BEHAVIOR_T toBehavior

  callback can decide about handling of data on timeout
- UINT32 serviceId

  the reserved field of the PD header

4.27.1 Detailed Description

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

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

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

- trdp_types.h

4.28 TRDP_PROCESS_CONFIG_T Struct Reference

Various flags/general TRDP options for library initialization.

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

Data Fields

- TRDP_LABEL_T hostName

  Host name.
- TRDP_LABEL_T leaderName

  Leader name dependant on redundancy concept.
- UINT32 cycleTime

  TRDP main process cycle time in us.
- UINT32 priority

  TRDP main process priority (0-255, 0=default, 255=highest)
- TRDP_OPTION_T options

  TRDP options.

4.28.1 Detailed Description

Various flags/general TRDP options for library initialization.

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

- trdp_types.h

4.29 TRDP_PROP_T Struct Reference

Application defined properties.

```
#include <tau_tti_types.h>
```

Data Fields

- TRDP_SHORT_VERSION_T ver

  properties version information, application defined
- UINT16 len

  properties length in number of octets, application defined, must be a multiple of 4 octets for alignment reasons value range: 0..32768
- UINT8 prop [1]

  properties, application defined

4.29.1 Detailed Description

Application defined properties.

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

- tau_tti_types.h

4.30 TRDP_SDT_PAR_T Struct Reference

Types to read out the XML configuration.

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

Data Fields

- UINT32 smi1

    Safe message identifier - unique for this message at consist level.
- UINT32 smi2

    Safe message identifier - unique for this message at consist level.
- UINT32 cmThr

    Channel monitoring threshold.
- UINT16 udv

    User data version.
- UINT16 rxPeriod

    Sink cycle time.
- UINT16 txPeriod

    Source cycle time.
- UINT16 nGuard

    Initial timeout cycles.
- UINT8 nrxSafe

    Timout cycles.
- UINT8 reserved1

    Reserved for future use.
- UINT16 lmiMax

    Latency monitoring cycles.

4.30.1 Detailed Description

Types to read out the XML configuration.

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

- tau_xml.h

4.31 TRDP_SEQ_CNT_ENTRY_T Struct Reference

Tuples of last received sequence counter per comId.

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

Data Fields

- UINT32 lastSeqCnt

  Sequence counter value for comId.
- TRDP_IP_ADDR_T srcIpAddr

  Source IP address.
- TRDP_MSG_T msgType

  message type

4.31.1 Detailed Description

Tuples of last received sequence counter per comId.

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

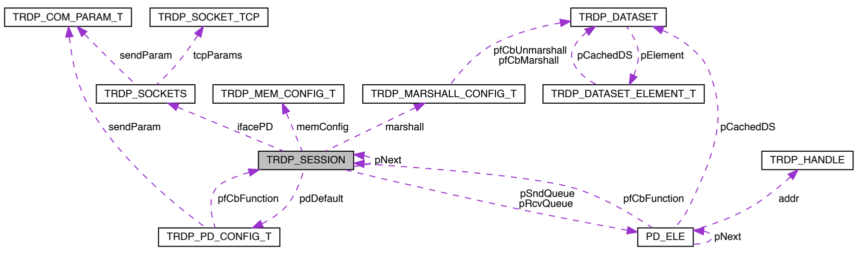
- trdp_private.h

4.32 TRDP_SESSION Struct Reference

Session/application variables store.

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

Collaboration diagram for TRDP_SESSION:



Data Fields

- struct TRDP_SESSION ∗ pNext

  Pointer to next session.
- VOS_MUTEX_T mutex

  protect this session
- VOS_MUTEX_T mutexTxPD

  protect the sending queue
- VOS_MUTEX_T mutexRxPD

  protect the receiving queue
- TRDP_IP_ADDR_T realIP

  Real IP address.

- TRDP_IP_ADDR_T virtualIP

  Virtual IP address.
- UINT32 etbTopoCnt

  current valid topocount or zero
- UINT32 opTrnTopoCnt

  current valid topocount or zero
- TRDP_TIME_T nextJob

  Store for next select interval.
- TRDP_PRINT_DBG_T pPrintDebugString

  Pointer to function to print debug information.
- TRDP_MARSHALL_CONFIG_T marshall

  Marshalling(unMarshalling configuration.
- TRDP_PD_CONFIG_T pdDefault

  Default configuration for process data.
- TRDP_MEM_CONFIG_T memConfig

  Internal memory handling configuration.
- TRDP_OPTION_T option

  Stack behavior options.
- TRDP_SOCKETS_T ifacePD [TRDP_MAX_PD_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
- PD_PACKET_T ∗ pNewFrame

  pointer to received PD frame
- TRDP_TIME_T initTime

  initialization time of session
- TRDP_STATISTICS_T stats

  statistics of this session

4.32.1 Detailed Description

Session/application variables store.

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

- trdp_private.h

4.33 TRDP_SOCKET_TCP Struct Reference

TCP parameters.

`#include <trdp_private.h>`

Data Fields

- TRDP_IP_ADDR_T cornerIp

  The other TCP corner Ip.
- BOOL8 notSend

  If the message has been sent uncompleted.
- TRDP_TIME_T connectionTimeout

  TCP socket connection Timeout.
- BOOL8 sendNotOk

  The sending timeout will be start.
- TRDP_TIME_T sendingTimeout

  The timeout sending the message.
- BOOL8 addFileDesc

  Ready to add the socket in the fd.
- BOOL8 morituri

  about to die

4.33.1 Detailed Description

TCP parameters.

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

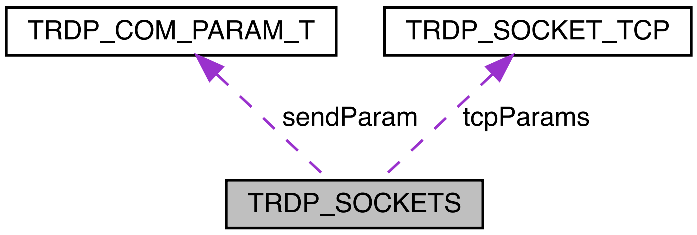
- trdp_private.h

4.34 TRDP_SOCKETS Struct Reference

Socket item.

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

Collaboration diagram for TRDP_SOCKETS:



Data Fields

- SOCKET sock

  vos socket descriptor to use
- TRDP_IP_ADDR_T bindAddr

  Defines the interface to use.
- TRDP_IP_ADDR_T srcAddr

  Defines the source interface to use.
- TRDP_SEND_PARAM_T sendParam

  Send parameters.
- TRDP_SOCK_TYPE_T type

  Usage of this socket.
- BOOL8 rcvMostly

  Used for receiving.
- INT16 usage

  No.
- TRDP_SOCKET_TCP_T tcpParams

  Params used for TCP.
- TRDP_IP_ADDR_T mcGroups [VOS_MAX_MULTICAST_CNT]

  List of multicast addresses for this socket.

4.34.1 Detailed Description

Socket item.

4.34.2 Field Documentation

4.34.2.1 usage

```
INT16 TRDP_SOCKETS::usage
```

No.

of current users of this socket

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

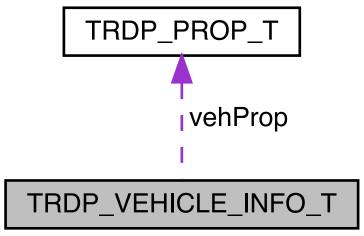
- trdp_private.h

4.35 TRDP_VEHICLE_INFO_T Struct Reference

vehicle information structure

```
#include <tau_tti_types.h>
```

Collaboration diagram for TRDP_VEHICLE_INFO_T:



Data Fields

- TRDP_NET_LABEL_T vehId

  vehicle identifier label,application defined (e.g.
- TRDP_NET_LABEL_T vehType

  vehicle type,application defined
- UINT8 vehOrient

  vehicle orientation '01'B = same as consist direction '10'B = inverse to consist direction
- UINT8 cstVehNo

  Sequence number of vehicle in consist(1..16)
- ANTIVALENT8 tractVeh

  vehicle is a traction vehicle '01'B = vehicle is not a traction vehicle '10'B = vehicle is a traction vehicle
- UINT8 reserved01

  for future use (= 0)
- TRDP_PROP_T vehProp

  static vehicle properties

4.35.1 Detailed Description

vehicle information structure

4.35.2 Field Documentation

4.35.2.1 vehId

```
TRDP_NET_LABEL_T TRDP_VEHICLE_INFO_T::vehId
```

vehicle identifier label,application defined (e.g.

UIC vehicle identification number) vehId of vehicle with vehNo==1 is used also as cstId

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

- tau_tti_types.h

4.36 TRDP_XML_DOC_HANDLE_T Struct Reference

Parsed XML document handle.

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

Data Fields

- struct XML_HANDLE ∗ pXmlDocument

    XML document context.

4.36.1 Detailed Description

Parsed XML document handle.

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

- tau_xml.h

4.37 VOS_SOCK_OPT_T Struct Reference

Common socket options.

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

Data Fields

- UINT8 qos
  quality/type of service 0...7
- UINT8 ttl
  time to live for unicast (default 64)
- UINT8 ttl_multicast
  time to live for multicast
- BOOL8 reuseAddrPort
  allow reuse of address and port
- BOOL8 nonBlocking
  use non blocking calls
- BOOL8 no_mc_loop
  no multicast loop back
- BOOL8 no_udp_crc
  supress udp crc computation
- BOOL8 txTime
  use transmit time on send, if available
- BOOL8 raw
  use raw socket, not for receiver!
- CHAR8 ifName [VOS_MAX_IF_NAME_SIZE]
  interface name if available

4.37.1 Detailed Description

Common socket options.

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

- vos_sock.h

4.38 VOS_VERSION_T Struct Reference

Version information.

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

Data Fields

- UINT8 ver
  Version - incremented for incompatible changes.
- UINT8 rel
  Release - incremented for compatible changes.
- UINT8 upd
  Update - incremented for bug fixes.
- UINT8 evo
  Evolution - incremented for build.

4.38.1 Detailed Description

Version information.

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

- vos_types.h

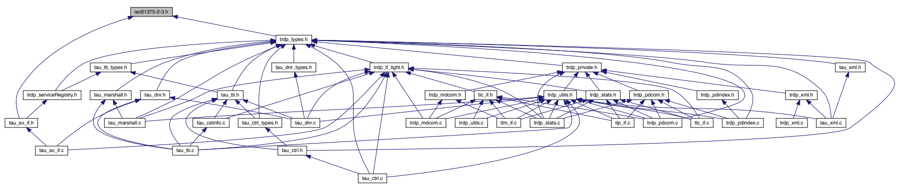
Chapter 5

File Documentation

5.1 iec61375-2-3.h File Reference

All definitions from IEC 61375-2-3.

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



Macros

- #define ETB_WAIT_TIMER_VALUE 5u /∗ Compute train dir. IEC61375-2-3 Ch. 5.3.2.3 ∗/

  Time out values (in seconds)
- #define TRDP_PD_UDP_PORT 17224u

  TRDP defines (from former trpd_proto.h)
- #define TRDP_MD_UDP_PORT 17225u

  IANA assigned message data UDP port.
- #define TRDP_MD_TCP_PORT 17225u

  IANA assigned message data TCP port.
- #define TRDP_PROTO_VER 0x0100u

  Protocol version.
- #define TRDP_PROTOCOL_VERSION_CHECK_MASK 0xFF00u

  Version check, two digits are relevant.
- #define TRDP_SESS_ID_SIZE 16u

  Session ID (UUID) size in MD header.
- #define TRDP_USR_URI_SIZE 32u

  max.
- #define TRDP_MD_INFINITE_TIME (0)

  Definitions for time out behaviour accd.

- #define TRDP_MD_DEFAULT_REPLY_TIMEOUT 5000000u

  Default MD communication parameters.
- #define TRDP_MD_DEFAULT_CONFIRM_TIMEOUT 1000000u

  [us] default confirm time out 1s
- #define TRDP_MD_DEFAULT_CONNECTION_TIMEOUT 60000000u

  [us] Socket connection time out 1min
- #define TRDP_MD_DEFAULT_SENDING_TIMEOUT 5000000u

  [us] Socket sending time out 5s
- #define TRDP_PD_DEFAULT_QOS 5u

  Default PD communication parameters.
- #define TRDP_PD_DEFAULT_TIMEOUT 100000u

  [us] 100ms default PD timeout
- #define TRDP_PROCESS_DEFAULT_CYCLE_TIME 10000u

  Default TRDP process options.
- #define TRDP_PROCESS_DEFAULT_PRIORITY 64u

  Default priority of TRDP process.
- #define TRDP_PROCESS_DEFAULT_OPTIONS TRDP_OPTION_TRAFFIC_SHAPING

  Default options for TRDP process.
- #define TRDP_MIN_PD_HEADER_SIZE sizeof(PD_HEADER_T)

  PD packet properties.
- #define TRDP_MAX_PD_DATA_SIZE 1432u

  PD data.
- #define TRDP_MAX_MD_DATA_SIZE 65388u

  MD packet properties.
- #define TRDP_MAX_MD_RETRIES 2u

  Maximum values.
- #define TRDP_MAX_LABEL_LEN 16u

  label length incl.
- #define TRDP_MAX_URI_USER_LEN (2u ∗ TRDP_MAX_LABEL_LEN)

  URI user part incl.
- #define TRDP_MAX_URI_HOST_LEN (5u ∗ TRDP_MAX_LABEL_LEN)

  URI host part incl.
- #define TRDP_MAX_URI_LEN (7u ∗ TRDP_MAX_LABEL_LEN)

  URI length incl.
- #define TRDP_MAX_FILE_NAME_LEN 128u

  path and file name length incl.
- #define TRDP_VAR_SIZE 0u

  Variable size dataset.
- #define TRDP_MSG_PD 0x5064u

  Message Types.
- #define TRDP_MSG_PP 0x5070u

  'Pp' PD Data (Pull Reply)
- #define TRDP_MSG_PR 0x5072u

  'Pr' PD Request
- #define TRDP_MSG_PE 0x5065u

  'Pe' PD Error
- #define TRDP_MSG_MN 0x4D6Eu

  'Mn' MD Notification (Request w/o reply)
- #define TRDP_MSG_MR 0x4D72u

  'Mr' MD Request with reply
- #define TRDP_MSG_MP 0x4D70u

'Mp' MD Reply without confirmation

- #define TRDP_MSG_MQ 0x4D71u

  'Mq' MD Reply with confirmation
- #define TRDP_MSG_MC 0x4D63u

  'Mc' MD Confirm
- #define TRDP_MSG_ME 0x4D65u

  'Me' MD Error
- #define ETB0_ALL_END_DEVICES_IP "239.193.0.0"

  from Table 22
- #define ETB_CTRL_COMID 1u

  Reserved COMIDs in the range 1 ...
- #define ETB_CTRL_CYCLE 500000u

  [us] 0.5s
- #define ETB_CTRL_TO_US 300000u

  [us] 3s
- #define TRDP_ETBCTRL_COMID ETB_CTRL_COMID

  alternative name
- #define CSTINFO_COMID 2u

  Consist Info telegram (Message data notification 'Mn')
- #define TRDP_CSTINFO_COMID CSTINFO_COMID

  alternative name
- #define CSTINFOCTRL_COMID 3u

  Consist Info control/request telegram (Message data notification 'Mn')
- #define TRDP_CSTINFOCTRL_COMID CSTINFOCTRL_COMID

  alternative name
- #define TRDP_COMID_ECHO 10u

  Reserved in Annex D & E.
- #define TRDP_STATISTICS_PULL_COMID 31u

  reserved in Table A.2
- #define TRDP_GLOBAL_STATS_REPLY_COMID 31u

  reserved in D.3
- #define TTDB_STATUS_COMID 100u

  TTDB manager telegram PD.
- #define TTDB_STATUS_CYCLE 1000000u

  [us] 1s Push
- #define TTDB_STATUS_TO_US 5000000u

  [us] 5s
- #define TTDB_OP_DIR_INFO_COMID 101u

  TTDB manager telegram MD: Push the OP_TRAIN_DIRECTORY.
- #define TTDB_OP_DIR_INFO_DS "TTDB_OP_TRAIN_DIRECTORY_INFO"

  OP_TRAIN_DIRECTORY.
- #define TTDB_TRN_DIR_REQ_COMID 102u

  TTDB manager telegram MD: Get the TRAIN_DIRECTORY.
- #define TTDB_TRN_DIR_REQ_TO_US 3000000u

  3s timeout
- #define TTDB_TRN_DIR_REP_COMID 103u

  MD reply.
- #define TTDB_TRN_DIR_REP_DS "TTDB_TRAIN_DIRECTORY_INFO_REPLY"

  TRAIN_DIRECTORY.
- #define TTDB_STAT_CST_REQ_COMID 104u

  TTDB manager telegram MD: Get the static consist information.

- #define TTDB_STAT_CST_REQ_TO_US 3000000u

  [us] 3s timeout
- #define TTDB_STAT_CST_REP_DS "TTDB_STATIC_CONSIST_INFO_REPLY"

  CONSIST_INFO.
- #define TTDB_NET_DIR_REQ_COMID 106u

  TTDB manager telegram MD: Get the NETWORK_TRAIN_DIRECTORY.
- #define TTDB_NET_DIR_REQ_TO_US 3000000u

  [us] 3s timeout
- #define TTDB_NET_DIR_REP_COMID 107u

  MD reply.
- #define TTDB_NET_DIR_REP_DS "TTDB_TRAIN_NETWORK_DIRECTORY_INFO_REPLY"

  TRAIN_NETWORK_DIRECTORY.
- #define TTDB_OP_DIR_INFO_REQ_COMID 108u

  TTDB manager telegram MD: Get the OP_TRAIN_DIRECTORY.
- #define TTDB_OP_DIR_INFO_REQ_TO_US 3000000u

  [us] 3s timeout
- #define TTDB_OP_DIR_INFO_REP_DS "TTDB_OP_TRAIN_DIR_INFO"

  OP_TRAIN_DIRECTORY.
- #define TTDB_READ_CMPLT_REQ_COMID 110u

  TTDB manager telegram MD: Get the TTDB.
- #define TTDB_READ_CMPLT_REQ_DS "TTDB_READ_COMPLETE_REQUEST"

  ETBx.
- #define TTDB_READ_CMPLT_REQ_TO_US 3000000u

  [us] 3s timeout
- #define TTDB_READ_CMPLT_REP_COMID 111u

  MD reply.
- #define TTDB_READ_CMPLT_REP_DS "TTDB_READ_COMPLETE_REPLY"

  TRDP_READ_COMPLETE_REPLY_T.
- #define ECSP_CTRL_COMID 120u

  ECSP Control telegram.
- #define ECSP_CTRL_CYCLE 1000000u

  [us] 1s
- #define ECSP_CTRL_TO_US 5000000u

  [us] 5s
- #define ECSP_CTRL_DEST_URI "devECSP.anyVeh.lCst.lClTrn.lTrn"

  10.0.0.1
- #define TRDP_ECSP_CTRL_COMID ECSP_CTRL_COMID

  Etb control message.
- #define ECSP_STATUS_COMID 121u

  ECSP status telegram.
- #define ECSP_STATUS_CYCLE 1000000u

  [us] 1s
- #define ECSP_STATUS_TO_US 5000000u

  [us] 5s
- #define ECSP_STATUS_DEST_URI "devECSC.anyVeh.lCst.lClTrn.lTrn"

  10.0.0.100
- #define ECSP_CONF_REQ_COMID 122u

  ECSP Confirmation Request telegram MD:
- #define ECSP_CONF_REQ_TO_US 3000000u

  [us]
- #define ECSP_CONF_REQ_URI "devECSP.anyVeh.lCst.lClTrn.lTrn"

10.0.0.1
- #define ECSP_CONF_REP_TO_US 3000000u

  [us]
- #define ETBN_CTRL_REQ_COMID 130u

  ETBN Control & Status Telegram MD.
- #define ETBN_CTRL_REQ_DS "ETBN_CTRL"

  ETBx.
- #define ETBN_CTRL_REQ_TO_US 3000000u

  [us] 3s timeout
- #define ETBN_CTRL_REP_DS "ETBN_STATUS"

  ETBN status reply.
- #define ETBN_TRN_NET_DIR_REQ_COMID 132u

  ETBN Control Telegram MD.
- #define ETBN_TRN_NET_DIR_REQ_TO_US 3000000u

  [us] 3s timeout
- #define TCN_DNS_REQ_COMID 140u

  TCN-DNS Request Telegram MD.
- #define TCN_DNS_REQ_TO_US 3000000u

  [us] 3s timeout
- #define TRDP_ETBCTRL_DSID 1u

  TRDP reserved data set ids in the range 1 ...

5.1.1 Detailed Description

All definitions from IEC 61375-2-3.

Note

Project: TCNOpen TRDP

Author

Bernd Loehr, NewTec GmbH, 2015-09-11

Remarks

5.1.2 Macro Definition Documentation

5.1.2.1 ETB_CTRL_COMID

```
#define ETB_CTRL_COMID 1u
```

Reserved COMIDs in the range 1 ...

1000 ETB Control telegram

5.1.2.2 TRDP_ETBCTRL_DSID

```
#define TRDP_ETBCTRL_DSID 1u
```

TRDP reserved data set ids in the range 1 ...

1000

5.1.2.3 TRDP_MAX_FILE_NAME_LEN

```
#define TRDP_MAX_FILE_NAME_LEN 128u
```

path and file name length incl.

terminating '0'

5.1.2.4 TRDP_MAX_LABEL_LEN

```
#define TRDP_MAX_LABEL_LEN 16u
```

label length incl.

terminating '0'

5.1.2.5 TRDP_MAX_MD_DATA_SIZE

```
#define TRDP_MAX_MD_DATA_SIZE 65388u
```

MD packet properties.

MD payload size

5.1.2.6 TRDP_MAX_URI_HOST_LEN

```
#define TRDP_MAX_URI_HOST_LEN (5u * TRDP_MAX_LABEL_LEN)
```

URI host part incl.

terminating '0'

5.1.2.7 TRDP_MAX_URI_LEN

```
#define TRDP_MAX_URI_LEN (7u * TRDP_MAX_LABEL_LEN)
```

URI length incl.

'.', '@' and terminating '0'

5.1.2.8 TRDP_MAX_URI_USER_LEN

```
#define TRDP_MAX_URI_USER_LEN (2u * TRDP_MAX_LABEL_LEN)
```

URI user part incl.

'.' and terminating '0'

5.1.2.9 TRDP_MD_DEFAULT_REPLY_TIMEOUT

```
#define TRDP_MD_DEFAULT_REPLY_TIMEOUT 5000000u
```

Default MD communication parameters.

[us] default reply timeout 5s

5.1.2.10 TRDP_MD_INFINITE_TIME

```
#define TRDP_MD_INFINITE_TIME (0)
```

Definitions for time out behaviour accd.

table A.18

5.1.2.11 TRDP_MIN_PD_HEADER_SIZE

```
#define TRDP_MIN_PD_HEADER_SIZE sizeof(PD_HEADER_T)
```

PD packet properties.

PD header size with FCS

5.1.2.12 TRDP_MSG_PD

```
#define TRDP_MSG_PD 0x5064u
```

Message Types.

'Pd' PD Data

5.1.2.13 TRDP_PD_UDP_PORT

```
#define TRDP_PD_UDP_PORT 17224u
```

TRDP defines (from former trpd_proto.h)

IANA assigned process data UDP port

5.1.2.14 TRDP_PROCESS_DEFAULT_CYCLE_TIME

```
#define TRDP_PROCESS_DEFAULT_CYCLE_TIME 10000u
```

Default TRDP process options.

[us] 10ms cycle time for TRDP process

5.1.2.15 TRDP_USR_URI_SIZE

```
#define TRDP_USR_URI_SIZE 32u
```

max.

User URI size in MD header

5.1.2.16 TTDB_NET_DIR_REQ_COMID

```
#define TTDB_NET_DIR_REQ_COMID 106u
```

TTDB manager telegram MD: Get the NETWORK_TRAIN_DIRECTORY.

MD request

5.1.2.17 TTDB_OP_DIR_INFO_COMID

```
#define TTDB_OP_DIR_INFO_COMID 101u
```

TTDB manager telegram MD: Push the OP_TRAIN_DIRECTORY.

MD notification

5.1.2.18 TTDB_STAT_CST_REQ_COMID

```
#define TTDB_STAT_CST_REQ_COMID 104u
```

TTDB manager telegram MD: Get the static consist information.

MD request

5.1.2.19 TTDB_TRN_DIR_REQ_COMID

```
#define TTDB_TRN_DIR_REQ_COMID 102u
```

TTDB manager telegram MD: Get the TRAIN_DIRECTORY.

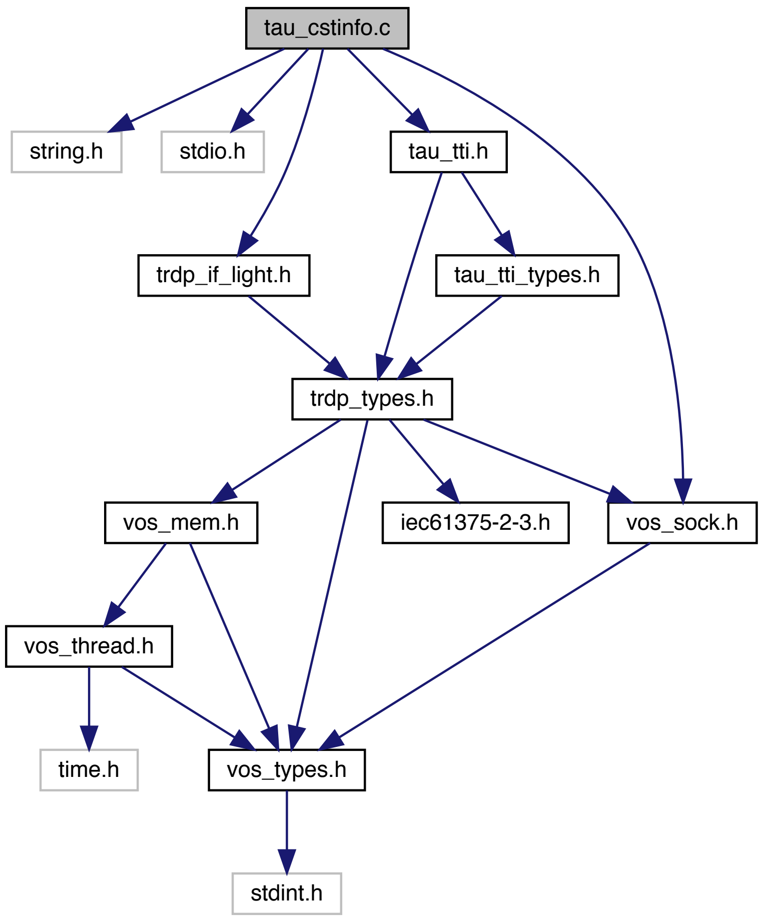
MD request

5.2 tau_cstinfo.c File Reference

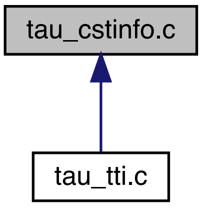
Functions for consist information access.

```
#include <string.h>
#include <stdio.h>
#include "trdp_if_light.h"
#include "tau_tti.h"
#include "vos_sock.h"
```

Include dependency graph for tau_cstinfo.c:



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



Functions

- UINT16 cstInfoGetPropSize (TRDP_CONSIST_INFO_T ∗pCstInfo)
  Getter function to retrieve a value from the consist info telegram value.

5.2.1 Detailed Description

Functions for consist information access.

Note

Project: TCNOpen TRDP prototype stack

Author

B. Loehr (initial version)

Remarks

5.2.2 Function Documentation

5.2.2.1 cstInfoGetPropSize()

```
UINT16 cstInfoGetPropSize (
            TRDP_CONSIST_INFO_T ∗ pCstInfo )
```

Getter function to retrieve a value from the consist info telegram value.

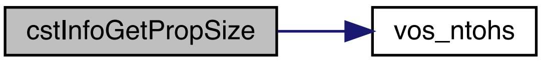
Parameters

in	*pCstInfo*	pointer to packed consist info in network byte order

Return values

len	

Here is the call graph for this function:

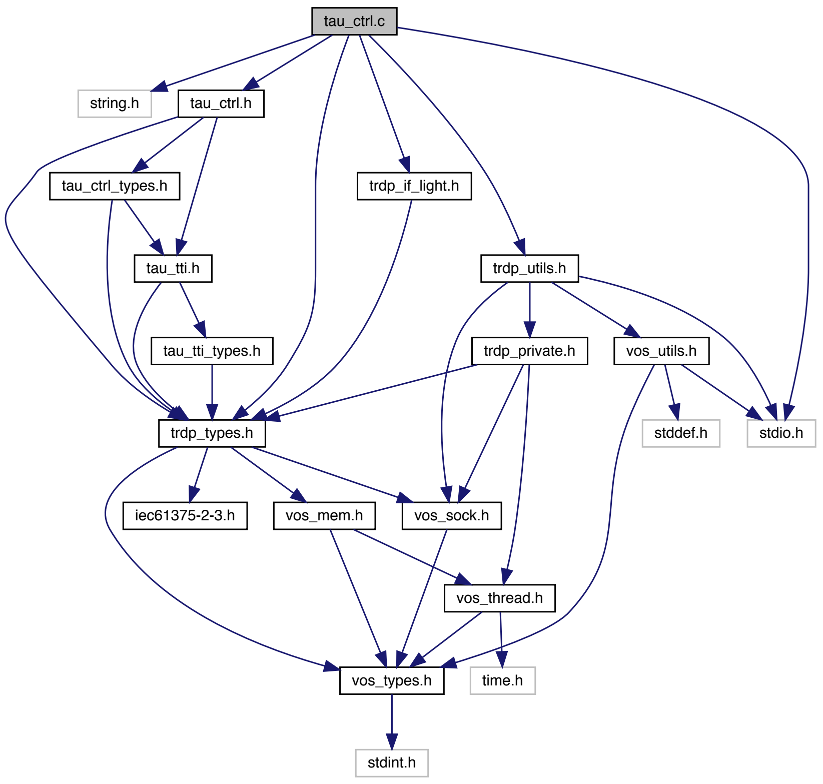


5.3 tau_ctrl.c File Reference

Functions for train switch control.

```
#include <string.h>
#include <stdio.h>
#include "trdp_types.h"
#include "trdp_utils.h"
#include "trdp_if_light.h"
#include "tau_ctrl.h"
```

Include dependency graph for tau_ctrl.c:



Functions

- EXT_DECL TRDP_ERR_T tau_initEcspCtrl (TRDP_APP_SESSION_T appHandle, TRDP_IP_ADDR_T ecspIpAddr)

    Function to init ECSP control interface.
- EXT_DECL TRDP_ERR_T tau_terminateEcspCtrl (TRDP_APP_SESSION_T appHandle)

    Function to close ECSP control interface.
- EXT_DECL TRDP_ERR_T tau_setEcspCtrl (TRDP_APP_SESSION_T appHandle, TRDP_ECSP_CTRL_T ∗pEcspCtrl)

    Function to set ECSP control information.
- EXT_DECL TRDP_ERR_T tau_getEcspStat (TRDP_APP_SESSION_T appHandle, TRDP_ECSP_STAT_T ∗pEcspStat, TRDP_PD_INFO_T ∗pPdInfo)

    Function to get ECSP status information.
- EXT_DECL TRDP_ERR_T tau_requestEcspConfirm (TRDP_APP_SESSION_T appHandle, const void ∗pUserRef, TRDP_MD_CALLBACK_T pfCbFunction, TRDP_ECSP_CONF_REQUEST_T ∗pEcspConf↩ Request)

    Function for ECSP confirmation/correction request, reply will be received via call back.

5.3.1 Detailed Description

Functions for train switch control.

Note

Project: TCNOpen TRDP prototype stack

Author

Armin-H. Weiss (initial version)

Remarks

5.3.2 Function Documentation

5.3.2.1 tau_getEcspStat()

```
EXT_DECL TRDP_ERR_T tau_getEcspStat (
            TRDP_APP_SESSION_T appHandle,
            TRDP_ECSP_STAT_T * pEcspStat,
            TRDP_PD_INFO_T * pPdInfo )
```

Function to get ECSP status information.

Parameters

in	*appHandle*	Application handle
in,out	*pEcspStat*	Pointer to the ECSP status structure
in,out	*pPdInfo*	Pointer to PD status information

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	module not initialised
TRDP_PARAM_ERR	Parameter error

5.3.2.2 tau_initEcspCtrl()

```
EXT_DECL TRDP_ERR_T tau_initEcspCtrl (
            TRDP_APP_SESSION_T appHandle,
            TRDP_IP_ADDR_T ecspIpAddr )
```

Function to init ECSP control interface.

Parameters

in	*appHandle*	Application handle
in	*ecspIpAddr*	ECSP address

Return values

TRDP_NO_ERR	no error
TRDP_INIT_ERR	initialisation error

5.3.2.3 tau_requestEcspConfirm()

```
EXT_DECL TRDP_ERR_T tau_requestEcspConfirm (
            TRDP_APP_SESSION_T appHandle,
            const void * pUserRef,
            TRDP_MD_CALLBACK_T pfCbFunction,
            TRDP_ECSP_CONF_REQUEST_T * pEcspConfRequest )
```

Function for ECSP confirmation/correction request, reply will be received via call back.

Parameters

in	*appHandle*	Application Handle
in	*pUserRef*	user reference returned with reply
in	*pfCbFunction*	Pointer to callback function, NULL for default
in	*pEcspConfRequest*	Pointer to confirmation data

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	module not initialised
TRDP_PARAM_ERR	Parameter error

5.3.2.4 tau_setEcspCtrl()

```
EXT_DECL TRDP_ERR_T tau_setEcspCtrl (
            TRDP_APP_SESSION_T appHandle,
            TRDP_ECSP_CTRL_T * pEcspCtrl )
```

Function to set ECSP control information.

Parameters

in	*appHandle*	Application handle
in	*pEcspCtrl*	Pointer to the ECSP control structure

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	module not initialised
TRDP_PARAM_ERR	Parameter error

5.3.2.5 tau_terminateEcspCtrl()

```
EXT_DECL TRDP_ERR_T tau_terminateEcspCtrl (
            TRDP_APP_SESSION_T appHandle )
```

Function to close ECSP control interface.

Parameters

in	*appHandle*	Application handle

Return values

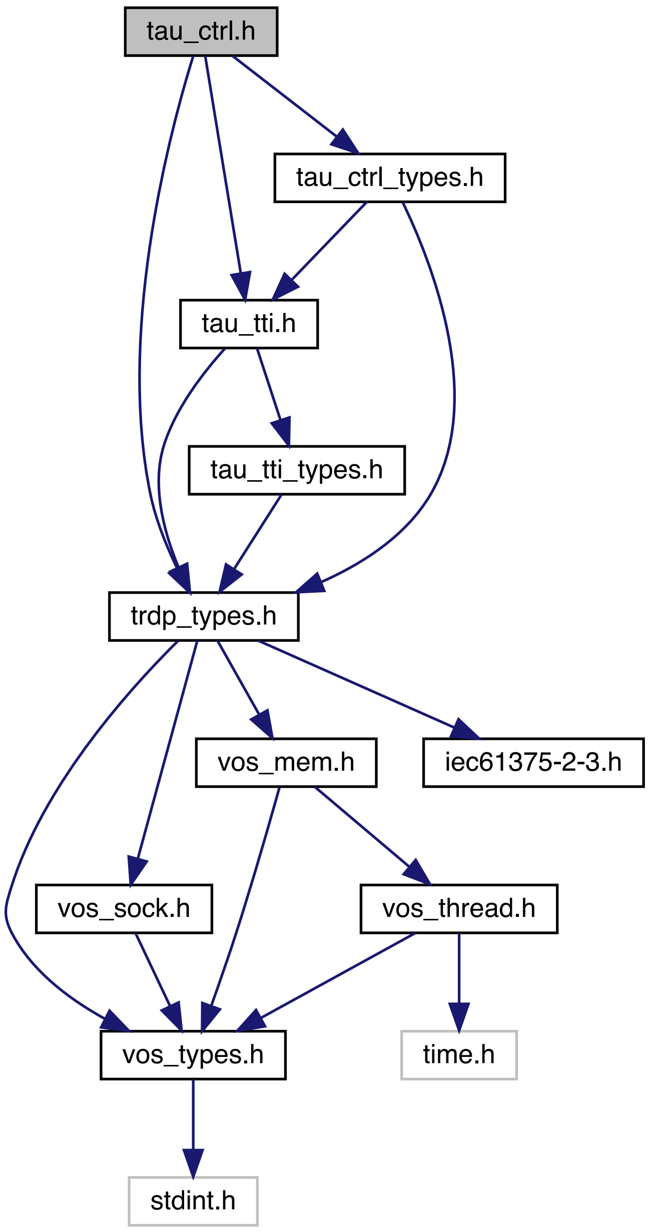
TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	module not initialised
TRDP_UNKNOWN_ERR	undefined error

5.4 tau_ctrl.h File Reference

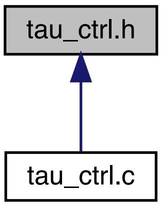
TRDP utility interface definitions.

```
#include "trdp_types.h"
#include "tau_tti.h"
#include "tau_ctrl_types.h"
```

Include dependency graph for tau_ctrl.h:



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



Functions

- EXT_DECL TRDP_ERR_T tau_initEcspCtrl (TRDP_APP_SESSION_T appHandle, TRDP_IP_ADDR_T ecspIpAddr)

  Function to init ECSP control interface.
- EXT_DECL TRDP_ERR_T tau_terminateEcspCtrl (TRDP_APP_SESSION_T appHandle)

  Function to close ECSP control interface.
- EXT_DECL TRDP_ERR_T tau_setEcspCtrl (TRDP_APP_SESSION_T appHandle, TRDP_ECSP_CTRL_T ∗pEcspCtrl)

  Function to set ECSP control information.
- EXT_DECL TRDP_ERR_T tau_getEcspStat (TRDP_APP_SESSION_T appHandle, TRDP_ECSP_STAT_T ∗pEcspStat, TRDP_PD_INFO_T ∗pPdInfo)

  Function to get ECSP status information.
- EXT_DECL TRDP_ERR_T tau_requestEcspConfirm (TRDP_APP_SESSION_T appHandle, const void ∗pUserRef, TRDP_MD_CALLBACK_T pfCbFunction, TRDP_ECSP_CONF_REQUEST_T ∗pEcspConf←Request)

  Function for ECSP confirmation/correction request, reply will be received via call back.

5.4.1 Detailed Description

TRDP utility interface definitions.

This module provides the interface to the following utilities

- ETB control

Note

Project: TCNOpen TRDP prototype stack

Author

Armin-H. Weiss (initial version)

Remarks

5.4.2 Function Documentation

5.4.2.1 tau_getEcspStat()

```
EXT_DECL TRDP_ERR_T tau_getEcspStat (
            TRDP_APP_SESSION_T appHandle,
            TRDP_ECSP_STAT_T * pEcspStat,
            TRDP_PD_INFO_T * pPdInfo )
```

Function to get ECSP status information.

Parameters

in	*appHandle*	Application Handle
in,out	*pEcspStat*	Pointer to the ECSP status structure
in,out	*pPdInfo*	Pointer to PD status information

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	module not initialised
TRDP_PARAM_ERR	Parameter error

Parameters

in	*appHandle*	Application handle
in,out	*pEcspStat*	Pointer to the ECSP status structure
in,out	*pPdInfo*	Pointer to PD status information

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	module not initialised
TRDP_PARAM_ERR	Parameter error

5.4.2.2 tau_initEcspCtrl()

```
EXT_DECL TRDP_ERR_T tau_initEcspCtrl (
            TRDP_APP_SESSION_T appHandle,
            TRDP_IP_ADDR_T ecspIpAddr )
```

Function to init ECSP control interface.

Parameters

in	*appHandle*	Application handle
in	*ecspIpAddr*	ECSP address

Return values

TRDP_NO_ERR	no error
TRDP_INIT_ERR	initialisation error

5.4.2.3 tau_requestEcspConfirm()

```
EXT_DECL TRDP_ERR_T tau_requestEcspConfirm (
            TRDP_APP_SESSION_T appHandle,
            const void * pUserRef,
            TRDP_MD_CALLBACK_T pfCbFunction,
            TRDP_ECSP_CONF_REQUEST_T * pEcspConfRequest )
```

Function for ECSP confirmation/correction request, reply will be received via call back.

Parameters

in	*appHandle*	Application Handle
in	*pUserRef*	user reference returned with reply
in	*pfCbFunction*	Pointer to callback function, NULL for default
in	*pEcspConfRequest*	Pointer to confirmation data

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	module not initialised
TRDP_PARAM_ERR	Parameter error

5.4.2.4 tau_setEcspCtrl()

```
EXT_DECL TRDP_ERR_T tau_setEcspCtrl (
            TRDP_APP_SESSION_T appHandle,
            TRDP_ECSP_CTRL_T * pEcspCtrl )
```

Function to set ECSP control information.

Parameters

in	*appHandle*	Application handle
in	*pEcspCtrl*	Pointer to the ECSP control structure

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	module not initialised
TRDP_PARAM_ERR	Parameter error

5.4.2.5 tau_terminateEcspCtrl()

```
EXT_DECL TRDP_ERR_T tau_terminateEcspCtrl (
            TRDP_APP_SESSION_T appHandle )
```

Function to close ECSP control interface.

Parameters

in	*appHandle*	Application handle

Return values

TRDP_NO_ERR	no error
TRDP_UNKNOWN_ERR	undefined error

Parameters

in	*appHandle*	Application handle

Return values

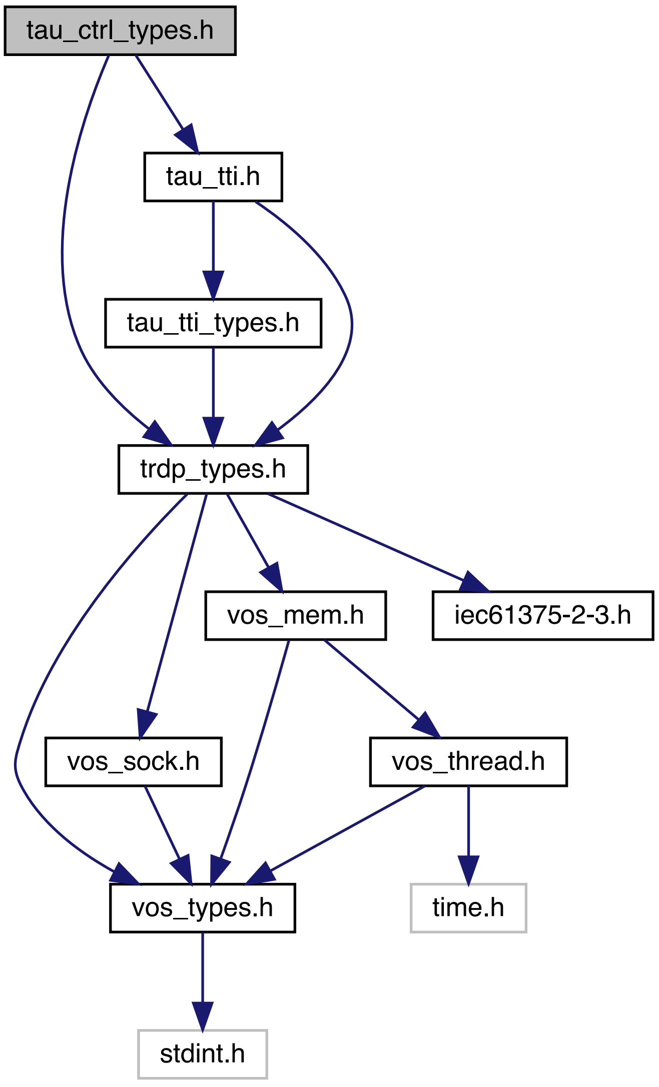
TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	module not initialised
TRDP_UNKNOWN_ERR	undefined error

5.5 tau_ctrl_types.h File Reference

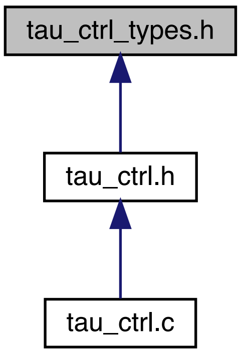
TRDP utility interface definitions.

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

Include dependency graph for tau_ctrl_types.h:



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



Data Structures

- struct GNU_PACKED

    Types for ETB control.
- struct GNU_PACKED

    Types for ETB control.
- struct GNU_PACKED

    Types for ETB control.
- struct GNU_PACKED

    Types for ETB control.
- struct GNU_PACKED

    Types for ETB control.
- struct GNU_PACKED

    Types for ETB control.
- struct GNU_PACKED

    Types for ETB control.
- struct GNU_PACKED

    Types for ETB control.
- struct GNU_PACKED

    Types for ETB control.

5.5.1 Detailed Description

TRDP utility interface definitions.

This module provides the interface to the following

- ETB control type definitions acc. to IEC61375-2-3

Note

Project: TCNOpen TRDP prototype stack

Author

Armin-H. Weiss (initial version)

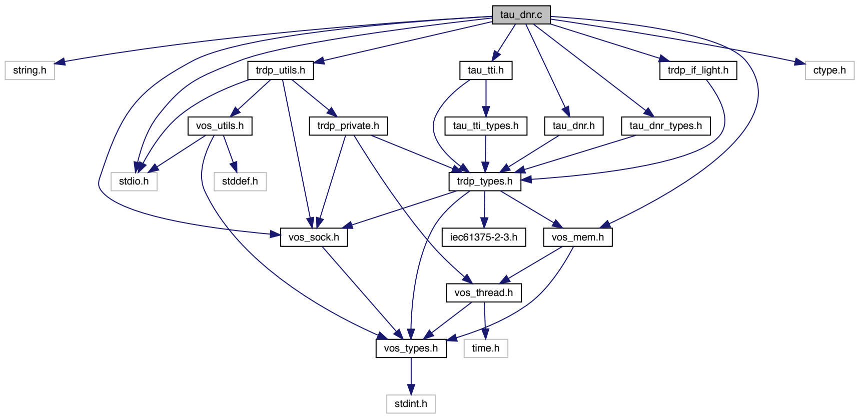
Remarks

5.6 tau_dnr.c File Reference

Functions for domain name resolution.

```
#include <string.h>
#include <stdio.h>
#include <ctype.h>
#include "tau_tti.h"
#include "tau_dnr.h"
#include "tau_dnr_types.h"
#include "trdp_utils.h"
#include "trdp_if_light.h"
#include "vos_mem.h"
#include "vos_sock.h"
```

Include dependency graph for tau_dnr.c:



Data Structures

- struct DNS_HEADER

  DNS header structure.

Macros

- #define TAU_MAX_NO_IF 4u

  Default interface should be in the first 4.
- #define TAU_DNS_TIME_OUT_LONG 10u

  Timeout in seconds for DNS server reply, if no hosts file provided.
- #define TAU_DNS_TIME_OUT_SHORT 1u

  Timeout in seconds for DNS server reply, if hosts file was provided.

Typedefs

- typedef struct DNS_HEADER TAU_DNS_HEADER_T

  DNS header structure.

Functions

- EXT_DECL TRDP_ERR_T tau_initDnr (TRDP_APP_SESSION_T appHandle, TRDP_IP_ADDR_T dnsIp↩ Addr, UINT16 dnsPort, const CHAR8 ∗pHostsFileName, TRDP_DNR_OPTS_T dnsOptions, BOOL8 wait↩ ForDnr)

  Function to init the DNR subsystem Initialize the DNR resolver.
- EXT_DECL void tau_deInitDnr (TRDP_APP_SESSION_T appHandle)

  Function to deinit DNR.
- EXT_DECL TRDP_DNR_STATE_T tau_DNRstatus (TRDP_APP_SESSION_T appHandle)

  Function to get the status of DNR.
- EXT_DECL TRDP_IP_ADDR_T tau_getOwnAddr (TRDP_APP_SESSION_T appHandle)

  Function to get the own IP address.
- EXT_DECL TRDP_ERR_T tau_uri2Addr (TRDP_APP_SESSION_T appHandle, TRDP_IP_ADDR_T ∗p↩ Addr, const TRDP_URI_T pUri)

  Function to convert a URI to an IP address.
- EXT_DECL TRDP_ERR_T tau_addr2Uri (TRDP_APP_SESSION_T appHandle, TRDP_URI_HOST_T pUri, TRDP_IP_ADDR_T addr)

  Function to convert an IP address to a URI.

5.6.1 Detailed Description

Functions for domain name resolution.

Note

Project: TCNOpen TRDP prototype stack

Author

B. Loehr (initial version)

Remarks

5.6.2 Function Documentation

5.6.2.1 tau_addr2Uri()

```
EXT_DECL TRDP_ERR_T tau_addr2Uri (
            TRDP_APP_SESSION_T appHandle,
            TRDP_URI_HOST_T pUri,
            TRDP_IP_ADDR_T addr )
```

Function to convert an IP address to a URI.

Receives an IP-Address and translates it into the host part of the corresponding URI. Both unicast and multicast addresses are accepted.

Parameters

in	*appHandle*	Handle returned by tlc_openSession()
out	*pUri*	Pointer to a string to return the URI host part
in	*addr*	IP address, 0==own address

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

5.6.2.2 tau_deInitDnr()

```
EXT_DECL void tau_deInitDnr (
            TRDP_APP_SESSION_T appHandle )
```

Function to deinit DNR.

Release any resources allocated by DNR.

Parameters

in	*appHandle*	Handle returned by tlc_openSession()

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

5.6.2.3 tau_DNRstatus()

```
EXT_DECL TRDP_DNR_STATE_T tau_DNRstatus (
            TRDP_APP_SESSION_T appHandle )
```

Function to get the status of DNR.

Parameters

in	*appHandle*	Handle returned by tlc_openSession()

Return values

TRDP_DNR_NOT_AVAILABLE	no error
TRDP_DNR_UNKNOWN	enabled, but cache is empty
TRDP_DNR_ACTIVE	enabled, cache has values
TRDP_DNR_HOSTSFILE	enabled, hostsfile used (static mode)

5.6.2.4 tau_getOwnAddr()

```
EXT_DECL TRDP_IP_ADDR_T tau_getOwnAddr (
            TRDP_APP_SESSION_T appHandle )
```

Function to get the own IP address.

Returns the IP address set by openSession. If it was 0 (INADDR_ANY), the address of the default adapter will be returned.

Parameters

in	*appHandle*	Handle returned by tlc_openSession()

Return values

own	IP address

5.6.2.5 tau_initDnr()

```
EXT_DECL TRDP_ERR_T tau_initDnr (
            TRDP_APP_SESSION_T appHandle,
            TRDP_IP_ADDR_T dnsIpAddr,
            UINT16 dnsPort,
            const CHAR8 * pHostsFileName,
            TRDP_DNR_OPTS_T dnsOptions,
            BOOL8 waitForDnr )
```

Function to init the DNR subsystem Initialize the DNR resolver.

Function to init DNR.

Depending on the supplied options, three operational modes are supported:

1. TRDP_DNR_COMMON_THREAD (default) Expect tlc_process running in a different, separate thread
2. TRDP_DNR_OWN_THREAD For single threaded systems only! Internally call tlc_process()
3. TRDP_DNR_STANDARD_DNS Use standard DNS instead of TCN-DNS. Default dnsPort (= 0) for TCN-DNS is 17225, for standard DNS it is 53.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
in	*dnsIpAddr*	DNS/ECSP IP address.
in	*dnsPort*	DNS port number.
in	*pHostsFileName*	Optional host file name as ECSP replacement/addition.
in	*dnsOptions*	Use existing thread (recommended), use own tlc_process loop or use standard DNS
in	*waitForDnr*	Waits for DNR if true(recommended), doesn't wait for DNR if false(for testing).

Return values

TRDP_NO_ERR	no error
TRDP_INIT_ERR	initialisation error

< default DNR/ECSP settings

5.6.2.6 tau_uri2Addr()

```
EXT_DECL TRDP_ERR_T tau_uri2Addr (
            TRDP_APP_SESSION_T appHandle,
            TRDP_IP_ADDR_T * pAddr,
            const TRDP_URI_T pUri )
```

Function to convert a URI to an IP address.

Receives an URI as input variable and translates this URI to an IP-Address. The URI may specify either a unicast or a multicast IP-Address.

Parameters

in	*appHandle*	Handle returned by tlc_openSession()
out	*pAddr*	Pointer to return the IP address
in	*pUri*	Pointer to an URI or an IP Address string, NULL==own URI

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error
TRDP_UNRESOLVED_ERR	Could not resolve error

Return values

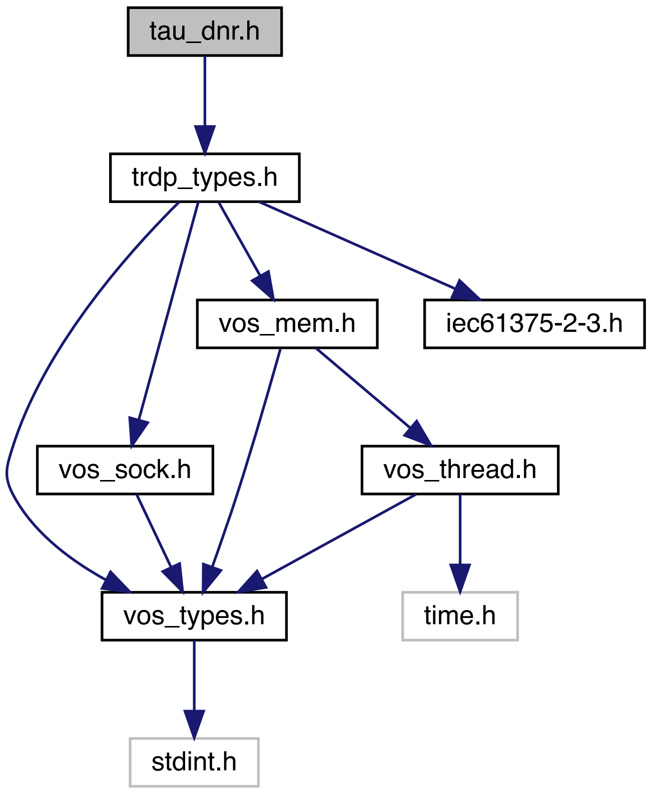
TRDP_TOPO_ERR	Cache/DB entry is invalid

5.7 tau_dnr.h File Reference

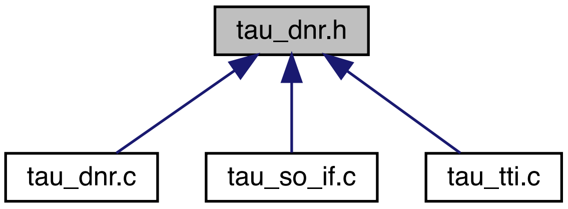
TRDP utility interface definitions.

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

Include dependency graph for tau_dnr.h:



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



Typedefs

- typedef enum TRDP_DNR_STATE TRDP_DNR_STATE_T

  DNR state.
- typedef enum TRDP_DNR_OPTS TRDP_DNR_OPTS_T

  DNR options.

Enumerations

- enum TRDP_DNR_STATE

  DNR state.
- enum TRDP_DNR_OPTS { , TRDP_DNR_OWN_THREAD = 1 }

  DNR options.

Functions

- EXT_DECL TRDP_ERR_T tau_initDnr (TRDP_APP_SESSION_T appHandle, TRDP_IP_ADDR_T dnsIp↩ Addr, UINT16 dnsPort, const CHAR8 ∗pHostsFileName, TRDP_DNR_OPTS_T dnsOptions, BOOL8 wait↩ ForDnr)

  Function to init DNR.
- EXT_DECL void tau_deInitDnr (TRDP_APP_SESSION_T appHandle)

  Release any resources allocated by DNR.
- EXT_DECL TRDP_DNR_STATE_T tau_DNRstatus (TRDP_APP_SESSION_T appHandle)

  Function to get the status of DNR.
- EXT_DECL TRDP_IP_ADDR_T tau_getOwnAddr (TRDP_APP_SESSION_T appHandle)

  Function to get the own IP address.
- EXT_DECL TRDP_ERR_T tau_uri2Addr (TRDP_APP_SESSION_T appHandle, TRDP_IP_ADDR_T ∗p↩ Addr, const TRDP_URI_T pUri)

  Function to convert a URI to an IP address.
- EXT_DECL TRDP_ERR_T tau_addr2Uri (TRDP_APP_SESSION_T appHandle, TRDP_URI_HOST_T pUri, TRDP_IP_ADDR_T addr)

  Function to convert an IP address to a URI.

5.7.1 Detailed Description

TRDP utility interface definitions.

This module provides the interface to the following utilities

- IP - URI address translation

Note

Project: TCNOpen TRDP prototype stack

Author

Armin-H. Weiss (initial version)

Remarks

5.7.2 Enumeration Type Documentation

5.7.2.1 TRDP_DNR_OPTS

```
enum TRDP_DNR_OPTS
```

DNR options.

Enumerator

TRDP_DNR_OWN_THREAD	For single threaded systems only! Internally call tlc_process()

5.7.3 Function Documentation

5.7.3.1 tau_addr2Uri()

```
EXT_DECL TRDP_ERR_T tau_addr2Uri (
            TRDP_APP_SESSION_T appHandle,
            TRDP_URI_HOST_T pUri,
            TRDP_IP_ADDR_T addr )
```

Function to convert an IP address to a URI.

Receives an IP-Address and translates it into the host part of the corresponding URI. Both unicast and multicast addresses are accepted.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pUri*	Pointer to a string to return the URI host part
in	*addr*	IP address, 0==own address

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

Receives an IP-Address and translates it into the host part of the corresponding URI. Both unicast and multicast addresses are accepted.

Parameters

in	*appHandle*	Handle returned by tlc_openSession()
out	*pUri*	Pointer to a string to return the URI host part
in	*addr*	IP address, 0==own address

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

5.7.3.2 tau_deInitDnr()

```
EXT_DECL void tau_deInitDnr (
            TRDP_APP_SESSION_T appHandle )
```

Release any resources allocated by DNR.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().

Return values

none	Release any resources allocated by DNR.

Parameters

`in`	*appHandle*	Handle returned by tlc_openSession()

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

5.7.3.3 tau_DNRstatus()

```
EXT_DECL TRDP_DNR_STATE_T tau_DNRstatus (
             TRDP_APP_SESSION_T appHandle )
```

Function to get the status of DNR.

Parameters

`in`	*appHandle*	Handle returned by tlc_openSession()

Return values

TRDP_DNR_NOT_AVAILABLE	no error
TRDP_DNR_UNKNOWN	enabled, but cache is empty
TRDP_DNR_ACTIVE	enabled, cache has values
TRDP_DNR_HOSTSFILE	enabled, hostsfile used (static mode)

5.7.3.4 tau_getOwnAddr()

```
EXT_DECL TRDP_IP_ADDR_T tau_getOwnAddr (
             TRDP_APP_SESSION_T appHandle )
```

Function to get the own IP address.

Parameters

`in`	*appHandle*	Handle returned by tlc_openSession().

Return values

own	IP address

Returns the IP address set by openSession. If it was 0 (INADDR_ANY), the address of the default adapter will be returned.

Parameters

in	*appHandle*	Handle returned by tlc_openSession()

Return values

own	IP address

5.7.3.5 tau_initDnr()

```
EXT_DECL TRDP_ERR_T tau_initDnr (
             TRDP_APP_SESSION_T appHandle,
             TRDP_IP_ADDR_T dnsIpAddr,
             UINT16 dnsPort,
             const CHAR8 * pHostsFileName,
             TRDP_DNR_OPTS_T dnsOptions,
             BOOL8 waitForDnr )
```

Function to init DNR.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
in	*dnsIpAddr*	DNS/ECSP IP address.
in	*dnsPort*	DNS port number.
in	*pHostsFileName*	Optional host file name as ECSP replacement/addition.
in	*dnsOptions*	Use existing thread (recommended), use own tlc_process loop or use standard DNS
in	*waitForDnr*	Waits for DNR if true(recommended), doesn't wait for DNR if false(for testing).

Return values

TRDP_NO_ERR	no error
TRDP_INIT_ERR	initialisation error

Function to init DNR.

Depending on the supplied options, three operational modes are supported:

1. TRDP_DNR_COMMON_THREAD (default) Expect tlc_process running in a different, separate thread
2. TRDP_DNR_OWN_THREAD For single threaded systems only! Internally call tlc_process()
3. TRDP_DNR_STANDARD_DNS Use standard DNS instead of TCN-DNS. Default dnsPort (= 0) for TCN-DNS is 17225, for standard DNS it is 53.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
in	*dnsIpAddr*	DNS/ECSP IP address.

Parameters

in	*dnsPort*	DNS port number.
in	*pHostsFileName*	Optional host file name as ECSP replacement/addition.
in	*dnsOptions*	Use existing thread (recommended), use own tlc_process loop or use standard DNS
in	*waitForDnr*	Waits for DNR if true(recommended), doesn't wait for DNR if false(for testing).

Return values

TRDP_NO_ERR	no error
TRDP_INIT_ERR	initialisation error

< default DNR/ECSP settings

5.7.3.6 tau_uri2Addr()

```
EXT_DECL TRDP_ERR_T tau_uri2Addr (
            TRDP_APP_SESSION_T appHandle,
            TRDP_IP_ADDR_T * pAddr,
            const TRDP_URI_T pUri )
```

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

in	*appHandle*	Handle returned by tlc_openSession().
out	*pAddr*	Pointer to return the IP address
in	*pUri*	Pointer to a URI or an IP Address string, NULL==own URI

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

Receives an URI as input variable and translates this URI to an IP-Address. The URI may specify either a unicast or a multicast IP-Address.

Parameters

in	*appHandle*	Handle returned by tlc_openSession()
out	*pAddr*	Pointer to return the IP address
in	*pUri*	Pointer to an URI or an IP Address string, NULL==own URI

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error
TRDP_UNRESOLVED_ERR	Could not resolve error

Return values

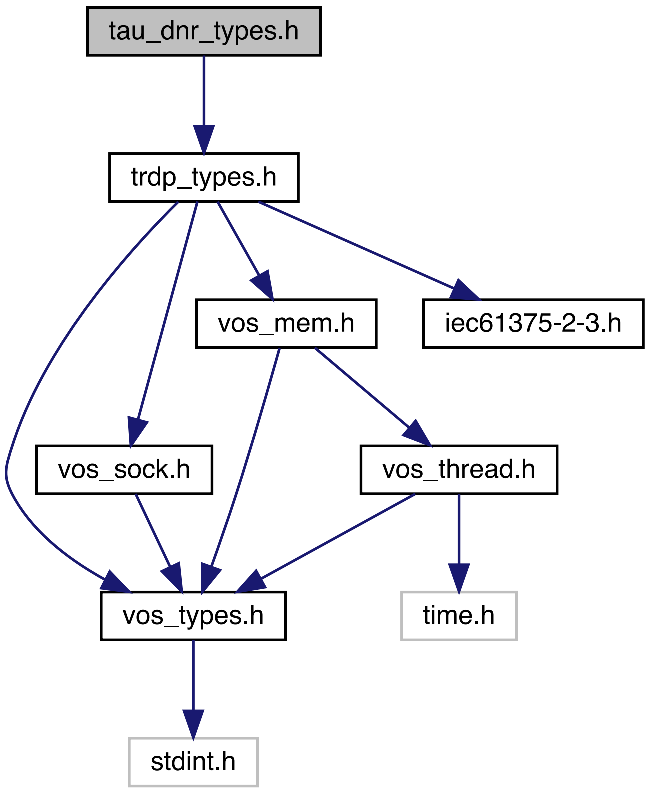
TRDP_TOPO_ERR	Cache/DB entry is invalid

5.8 tau_dnr_types.h File Reference

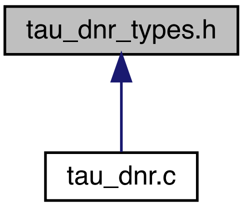
TRDP utility interface definitions.

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

Include dependency graph for tau_dnr_types.h:



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



Data Structures

- struct TCN_URI

    TCN-DNS simplified header structures.
- struct TRDP_DNS_REQUEST

    TCN-DNS Request telegram TCN_DNS_REQ_DS.
- struct TRDP_DNS_REPLY

    TCN-DNS Reply telegram TCN_DNS_REP_DS.

Typedefs

- typedef struct TCN_URI TCN_URI_T

    TCN-DNS simplified header structures.
- typedef struct TRDP_DNS_REQUEST TRDP_DNS_REQUEST_T

    TCN-DNS Request telegram TCN_DNS_REQ_DS.
- typedef struct TRDP_DNS_REPLY TRDP_DNS_REPLY_T

    TCN-DNS Reply telegram TCN_DNS_REP_DS.

5.8.1 Detailed Description

TRDP utility interface definitions.

This module provides typedefs to the following utilities

- IP - URI address translation

Note

Project: TCNOpen TRDP prototype stack

Author

Bernd Loehr (initial version)

Remarks

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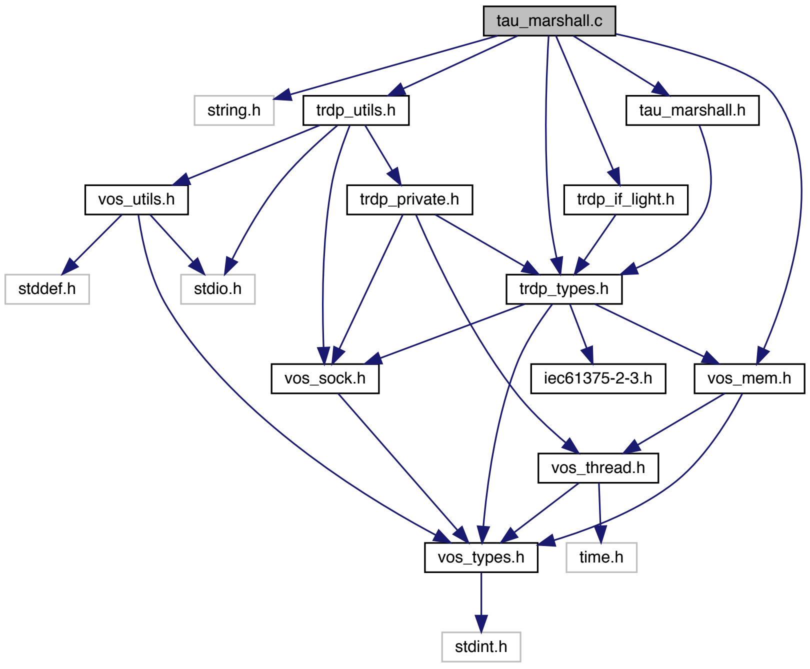
5.9 tau_marshall.c File Reference

Marshalling functions for TRDP.

```
#include <string.h>
#include "trdp_types.h"
#include "trdp_if_light.h"
#include "trdp_utils.h"
#include "vos_mem.h"
#include "tau_marshall.h"
```
Include dependency graph for tau_marshall.c:



Data Structures

- struct TAU_MARSHALL_INFO_T

  Marshalling info, used to and from wire.

Functions

- EXT_DECL TRDP_ERR_T tau_initMarshall (void ∗∗ppRefCon, UINT32 numComId, TRDP_COMID_DSID_MAP_T ∗pComIdDsIdMap, UINT32 numDataSet, TRDP_DATASET_T ∗pDataset[ ])

  Function to initialise the marshalling/unmarshalling.
- EXT_DECL TRDP_ERR_T tau_marshall (void ∗pRefCon, UINT32 comId, UINT8 ∗pSrc, UINT32 srcSize, UINT8 ∗pDest, UINT32 ∗pDestSize, TRDP_DATASET_T ∗∗ppDSPointer)

  marshall function.
- EXT_DECL TRDP_ERR_T tau_unmarshall (void ∗pRefCon, UINT32 comId, UINT8 ∗pSrc, UINT32 srcSize, UINT8 ∗pDest, UINT32 ∗pDestSize, TRDP_DATASET_T ∗∗ppDSPointer)

unmarshall function.

- EXT_DECL TRDP_ERR_T tau_marshallDs (void ∗pRefCon, UINT32 dsId, UINT8 ∗pSrc, UINT32 srcSize, UINT8 ∗pDest, UINT32 ∗pDestSize, TRDP_DATASET_T ∗∗ppDSPointer)

  marshall data set function.
- EXT_DECL TRDP_ERR_T tau_unmarshallDs (void ∗pRefCon, UINT32 dsId, UINT8 ∗pSrc, UINT32 srcSize, UINT8 ∗pDest, UINT32 ∗pDestSize, TRDP_DATASET_T ∗∗ppDSPointer)

  unmarshall data set function.
- EXT_DECL TRDP_ERR_T tau_calcDatasetSize (void ∗pRefCon, UINT32 dsId, UINT8 ∗pSrc, UINT32 src←Size, UINT32 ∗pDestSize, TRDP_DATASET_T ∗∗ppDSPointer)

  Calculate data set size by given data set id.
- EXT_DECL TRDP_ERR_T tau_calcDatasetSizeByComId (void ∗pRefCon, UINT32 comId, UINT8 ∗pSrc, U←INT32 srcSize, UINT32 ∗pDestSize, TRDP_DATASET_T ∗∗ppDSPointer)

  Calculate data set size by given ComId.

5.9.1 Detailed Description

Marshalling functions for TRDP.

Note

Project: TCNOpen TRDP prototype stack

Author

Bernd Loehr, NewTec GmbH

Remarks

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5.9.2 Function Documentation

5.9.2.1 tau_calcDatasetSize()

```
EXT_DECL TRDP_ERR_T tau_calcDatasetSize (
            void * pRefCon,
            UINT32 dsId,
            UINT8 * pSrc,
            UINT32 srcSize,
            UINT32 * pDestSize,
            TRDP_DATASET_T ** ppDSPointer )
```

Calculate data set size by given data set id.

Parameters

in	*pRefCon*	Pointer to user context
in	*dsId*	Dataset id to identify the structure out of a configuration
in	*pSrc*	Pointer to received original message
in	*srcSize*	size of the source buffer
out	*pDestSize*	Pointer to the size of the data set
in,out	*ppDSPointer*	pointer to pointer to cached dataset, set NULL if not used, set content NULL if unknown

Return values

TRDP_INIT_ERR	marshalling not initialised
TRDP_NO_ERR	no error
TRDP_MEM_ERR	provided buffer to small
TRDP_PARAM_ERR	Parameter error
TRDP_STATE_ERR	Too deep recursion
TRDP_COMID_ERR	comid not existing
TRDP_MARSHALLING_ERR	dataset/source size mismatch

5.9.2.2 tau_calcDatasetSizeByComId()

```
EXT_DECL TRDP_ERR_T tau_calcDatasetSizeByComId (
             void * pRefCon,
             UINT32 comId,
             UINT8 * pSrc,
             UINT32 srcSize,
             UINT32 * pDestSize,
             TRDP_DATASET_T ** ppDSPointer )
```

Calculate data set size by given ComId.

Parameters

in	*pRefCon*	Pointer to user context
in	*comId*	ComId id to identify the structure out of a configuration
in	*pSrc*	Pointer to received original message
in	*srcSize*	size of the source buffer
out	*pDestSize*	Pointer to the size of the data set
in,out	*ppDSPointer*	pointer to pointer to cached dataset, set NULL if not used, set content NULL if unknown

Return values

TRDP_INIT_ERR	marshalling not initialised
TRDP_NO_ERR	no error
TRDP_MEM_ERR	provided buffer to small
TRDP_PARAM_ERR	Parameter error
TRDP_STATE_ERR	Too deep recursion

Return values

TRDP_COMID_ERR	comid not existing
TRDP_MARSHALLING_ERR	dataset/source size mismatch

5.9.2.3 tau_initMarshall()

```
EXT_DECL TRDP_ERR_T tau_initMarshall (
             void ** ppRefCon,
             UINT32 numComId,
             TRDP_COMID_DSID_MAP_T * pComIdDsIdMap,
             UINT32 numDataSet,
             TRDP_DATASET_T * pDataset[ ] )
```

Function to initialise the marshalling/unmarshalling.

Types for marshalling / unmarshalling.

The supplied array must be sorted by ComIds. The array must exist during the use of the marshalling functions (until tlc_terminate()).

Parameters

in,out	*ppRefCon*	Returns a pointer to be used for the reference context of marshalling/unmarshalling
in	*numComId*	Number of datasets found in the configuration
in	*pComIdDsIdMap*	Pointer to an array of structures of type TRDP_DATASET_T
in	*numDataSet*	Number of datasets found in the configuration
in	*pDataset*	Pointer to an array of pointers to 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

5.9.2.4 tau_marshall()

```
EXT_DECL TRDP_ERR_T tau_marshall (
             void * pRefCon,
             UINT32 comId,
             UINT8 * pSrc,
             UINT32 srcSize,
             UINT8 * pDest,
             UINT32 * pDestSize,
             TRDP_DATASET_T ** ppDSPointer )
```

marshall function.

Parameters

in	*pRefCon*	pointer to user context
in	*comId*	ComId to identify the structure out of a configuration
in	*pSrc*	pointer to received original message
in	*srcSize*	size of the source buffer
in	*pDest*	pointer to a buffer for the treated message
in,out	*pDestSize*	size of the provide buffer / size of the treated message
in,out	*ppDSPointer*	pointer to pointer to cached dataset set NULL if not used, set content NULL if unknown

Return values

TRDP_NO_ERR	no error
TRDP_MEM_ERR	provided buffer to small
TRDP_PARAM_ERR	Parameter error
TRDP_STATE_ERR	Too deep recursion
TRDP_MARSHALLING_ERR	dataset/source size mismatch

5.9.2.5 tau_marshallDs()

```
EXT_DECL TRDP_ERR_T tau_marshallDs (
             void * pRefCon,
             UINT32 dsId,
             UINT8 * pSrc,
             UINT32 srcSize,
             UINT8 * pDest,
             UINT32 * pDestSize,
             TRDP_DATASET_T ** ppDSPointer )
```

marshall data set function.

Parameters

in	*pRefCon*	pointer to user context
in	*dsId*	Data set id to identify the structure out of a configuration
in	*pSrc*	pointer to received original message
in	*srcSize*	size of the source buffer
in	*pDest*	pointer to a buffer for the treated message
in,out	*pDestSize*	size of the provide buffer / size of the treated message
in,out	*ppDSPointer*	pointer to pointer to cached dataset set NULL if not used, set content NULL if unknown

Return values

TRDP_INIT_ERR	marshalling not initialised
TRDP_NO_ERR	no error
TRDP_MEM_ERR	provided buffer to small
TRDP_PARAM_ERR	Parameter error

Return values

TRDP_STATE_ERR	Too deep recursion
TRDP_COMID_ERR	comid not existing
TRDP_MARSHALLING_ERR	dataset/source size mismatch

5.9.2.6 tau_unmarshall()

```
EXT_DECL TRDP_ERR_T tau_unmarshall (
             void * pRefCon,
             UINT32 comId,
             UINT8 * pSrc,
             UINT32 srcSize,
             UINT8 * pDest,
             UINT32 * pDestSize,
             TRDP_DATASET_T ** ppDSPointer )
```

unmarshall function.

Parameters

in	*pRefCon*	pointer to user context
in	*comId*	ComId to identify the structure out of a configuration
in	*pSrc*	pointer to received original message
in	*srcSize*	size of the source buffer
in	*pDest*	pointer to a buffer for the treated message
in,out	*pDestSize*	size of the provide buffer / size of the treated message
in,out	*ppDSPointer*	pointer to pointer to cached dataset set NULL if not used, set content NULL if unknown

Return values

TRDP_INIT_ERR	marshalling not initialised
TRDP_NO_ERR	no error
TRDP_MEM_ERR	provided buffer to small
TRDP_PARAM_ERR	Parameter error
TRDP_STATE_ERR	Too deep recursion
TRDP_COMID_ERR	comid not existing
TRDP_MARSHALLING_ERR	dataset/source size mismatch

5.9.2.7 tau_unmarshallDs()

```
EXT_DECL TRDP_ERR_T tau_unmarshallDs (
             void * pRefCon,
             UINT32 dsId,
             UINT8 * pSrc,
             UINT32 srcSize,
             UINT8 * pDest,
             UINT32 * pDestSize,
             TRDP_DATASET_T ** ppDSPointer )
```

unmarshall data set function.

Parameters

in	*pRefCon*	pointer to user context
in	*dsId*	Data set id to identify the structure out of a configuration
in	*pSrc*	pointer to received original message
in	*srcSize*	size of the source buffer
in	*pDest*	pointer to a buffer for the treated message
in,out	*pDestSize*	size of the provide buffer / size of the treated message
in,out	*ppDSPointer*	pointer to pointer to cached dataset set NULL if not used, set content NULL if unknown

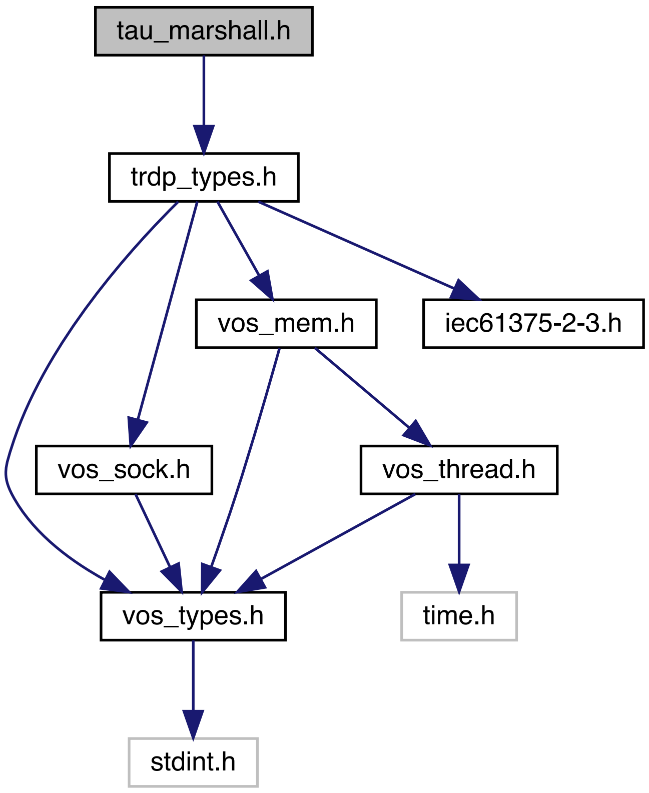
Return values

TRDP_INIT_ERR	marshalling not initialised
TRDP_NO_ERR	no error
TRDP_MEM_ERR	provided buffer to small
TRDP_PARAM_ERR	Parameter error
TRDP_STATE_ERR	Too deep recursion
TRDP_COMID_ERR	comid not existing
TRDP_MARSHALLING_ERR	dataset/source size mismatch

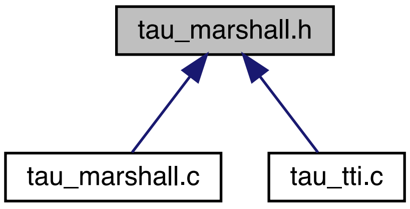
5.10 tau_marshall.h File Reference

TRDP utility interface definitions.

```
#include "trdp_types.h"
```
Include dependency graph for tau_marshall.h:



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



Functions

- EXT_DECL TRDP_ERR_T tau_initMarshall (void ∗∗ppRefCon, UINT32 numComId, TRDP_COMID_DSID_MAP_T ∗pComIdDsIdMap, UINT32 numDataSet, TRDP_DATASET_T ∗pDataset[ ])

Types for marshalling / unmarshalling.

- EXT_DECL TRDP_ERR_T tau_marshall (void ∗pRefCon, UINT32 comId, UINT8 ∗pSrc, UINT32 srcSize, UINT8 ∗pDest, UINT32 ∗pDestSize, TRDP_DATASET_T ∗∗ppDSPointer)

  marshall function.
- EXT_DECL TRDP_ERR_T tau_marshallDs (void ∗pRefCon, UINT32 dsId, UINT8 ∗pSrc, UINT32 srcSize, UINT8 ∗pDest, UINT32 ∗pDestSize, TRDP_DATASET_T ∗∗ppDSPointer)

  marshall data set function.
- EXT_DECL TRDP_ERR_T tau_unmarshall (void ∗pRefCon, UINT32 comId, UINT8 ∗pSrc, UINT32 srcSize, UINT8 ∗pDest, UINT32 ∗pDestSize, TRDP_DATASET_T ∗∗ppDSPointer)

  unmarshall function.
- EXT_DECL TRDP_ERR_T tau_unmarshallDs (void ∗pRefCon, UINT32 dsId, UINT8 ∗pSrc, UINT32 srcSize, UINT8 ∗pDest, UINT32 ∗pDestSize, TRDP_DATASET_T ∗∗ppDSPointer)

  unmarshall data set function.
- EXT_DECL TRDP_ERR_T tau_calcDatasetSize (void ∗pRefCon, UINT32 dsId, UINT8 ∗pSrc, UINT32 src←Size, UINT32 ∗pDestSize, TRDP_DATASET_T ∗∗ppDSPointer)

  Calculate data set size by given data set id.
- EXT_DECL TRDP_ERR_T tau_calcDatasetSizeByComId (void ∗pRefCon, UINT32 comId, UINT8 ∗pSrc, U←INT32 srcSize, UINT32 ∗pDestSize, TRDP_DATASET_T ∗∗ppDSPointer)

  Calculate data set size by given ComId.

5.10.1 Detailed Description

TRDP utility interface definitions.

This module provides the interface to the following utilities

- marshalling/unmarshalling

Note

Project: TCNOpen TRDP prototype stack

Author

Armin-H. Weiss

Remarks

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5.10.2 Function Documentation

5.10.2.1 tau_calcDatasetSize()

```
EXT_DECL TRDP_ERR_T tau_calcDatasetSize (
             void * pRefCon,
             UINT32 dsId,
             UINT8 * pSrc,
             UINT32 srcSize,
             UINT32 * pDestSize,
             TRDP_DATASET_T ** ppDSPointer )
```

Calculate data set size by given data set id.

Parameters

in	*pRefCon*	Pointer to user context
in	*dsId*	Dataset id to identify the structure out of a configuration
in	*pSrc*	Pointer to received original message
in	*srcSize*	size of the source buffer
out	*pDestSize*	Pointer to the size of the data set
in,out	*ppDSPointer*	pointer to pointer to cached dataset, set NULL if not used, set content NULL if unknown

Return values

TRDP_NO_ERR	no error
TRDP_INIT_ERR	marshalling not initialised
TRDP_PARAM_ERR	data set id not existing

Parameters

in	*pRefCon*	Pointer to user context
in	*dsId*	Dataset id to identify the structure out of a configuration
in	*pSrc*	Pointer to received original message
in	*srcSize*	size of the source buffer
out	*pDestSize*	Pointer to the size of the data set
in,out	*ppDSPointer*	pointer to pointer to cached dataset, set NULL if not used, set content NULL if unknown

Return values

TRDP_INIT_ERR	marshalling not initialised
TRDP_NO_ERR	no error
TRDP_MEM_ERR	provided buffer to small
TRDP_PARAM_ERR	Parameter error
TRDP_STATE_ERR	Too deep recursion
TRDP_COMID_ERR	comid not existing
TRDP_MARSHALLING_ERR	dataset/source size mismatch

5.10.2.2 tau_calcDatasetSizeByComId()

```
EXT_DECL TRDP_ERR_T tau_calcDatasetSizeByComId (
             void * pRefCon,
             UINT32 comId,
             UINT8 * pSrc,
             UINT32 srcSize,
             UINT32 * pDestSize,
             TRDP_DATASET_T ** ppDSPointer )
```

Calculate data set size by given ComId.

Parameters

in	*pRefCon*	Pointer to user context
in	*comId*	ComId id to identify the structure out of a configuration
in	*pSrc*	Pointer to received original message
in	*srcSize*	size of the source buffer
out	*pDestSize*	Pointer to the size of the data set
in,out	*ppDSPointer*	pointer to pointer to cached dataset, set NULL if not used, set content NULL if unknown

Return values

TRDP_NO_ERR	no error
TRDP_INIT_ERR	marshalling not initialised
TRDP_PARAM_ERR	data set id not existing

Parameters

in	*pRefCon*	Pointer to user context
in	*comId*	ComId id to identify the structure out of a configuration
in	*pSrc*	Pointer to received original message
in	*srcSize*	size of the source buffer
out	*pDestSize*	Pointer to the size of the data set
in,out	*ppDSPointer*	pointer to pointer to cached dataset, set NULL if not used, set content NULL if unknown

Return values

TRDP_INIT_ERR	marshalling not initialised
TRDP_NO_ERR	no error
TRDP_MEM_ERR	provided buffer to small
TRDP_PARAM_ERR	Parameter error
TRDP_STATE_ERR	Too deep recursion
TRDP_COMID_ERR	comid not existing
TRDP_MARSHALLING_ERR	dataset/source size mismatch

5.10.2.3 tau_initMarshall()

```
EXT_DECL TRDP_ERR_T tau_initMarshall (
             void ** ppRefCon,
             UINT32 numComId,
             TRDP_COMID_DSID_MAP_T * pComIdDsIdMap,
             UINT32 numDataSet,
             TRDP_DATASET_T * pDataset[ ] )
```

Types for marshalling / unmarshalling.

Function to initialise the marshalling/unmarshalling.

Parameters

in,out	*ppRefCon*	Returns a pointer to be used for the reference context of marshalling/unmarshalling
in	*numComId*	Number of datasets found in the configuration
in	*pComIdDsIdMap*	Pointer to an array of structures of type TRDP_DATASET_T
in	*numDataSet*	Number of datasets found in the configuration
in	*pDataset*	Pointer to an array of pointers to 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

Types for marshalling / unmarshalling.

The supplied array must be sorted by ComIds. The array must exist during the use of the marshalling functions (until tlc_terminate()).

Parameters

in,out	*ppRefCon*	Returns a pointer to be used for the reference context of marshalling/unmarshalling
in	*numComId*	Number of datasets found in the configuration
in	*pComIdDsIdMap*	Pointer to an array of structures of type TRDP_DATASET_T
in	*numDataSet*	Number of datasets found in the configuration
in	*pDataset*	Pointer to an array of pointers to 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

5.10.2.4 tau_marshall()

```
EXT_DECL TRDP_ERR_T tau_marshall (
             void * pRefCon,
             UINT32 comId,
             UINT8 * pSrc,
             UINT32 srcSize,
             UINT8 * pDest,
             UINT32 * pDestSize,
             TRDP_DATASET_T ** ppDSPointer )
```

marshall function.

Parameters

in	*pRefCon*	pointer to user context
in	*comId*	ComId to identify the structure out of a configuration
in	*pSrc*	pointer to received original message
in	*srcSize*	size of the source buffer
in	*pDest*	pointer to a buffer for the treated message
in,out	*pDestSize*	size of the provide buffer / size of the treated message
in,out	*ppDSPointer*	pointer to pointer to cached dataset set NULL if not used, set content NULL if unknown

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
TRDP_PARAM_ERR	Parameter error

Parameters

in	*pRefCon*	pointer to user context
in	*comId*	ComId to identify the structure out of a configuration
in	*pSrc*	pointer to received original message
in	*srcSize*	size of the source buffer
in	*pDest*	pointer to a buffer for the treated message
in,out	*pDestSize*	size of the provide buffer / size of the treated message
in,out	*ppDSPointer*	pointer to pointer to cached dataset set NULL if not used, set content NULL if unknown

Return values

TRDP_NO_ERR	no error
TRDP_MEM_ERR	provided buffer to small
TRDP_PARAM_ERR	Parameter error
TRDP_STATE_ERR	Too deep recursion
TRDP_MARSHALLING_ERR	dataset/source size mismatch

5.10.2.5 tau_marshallDs()

```
EXT_DECL TRDP_ERR_T tau_marshallDs (
             void * pRefCon,
             UINT32 dsId,
             UINT8 * pSrc,
             UINT32 srcSize,
             UINT8 * pDest,
             UINT32 * pDestSize,
             TRDP_DATASET_T ** ppDSPointer )
```

marshall data set function.

Parameters

`in`	*pRefCon*	pointer to user context
`in`	*dsId*	Data set id to identify the structure out of a configuration
`in`	*pSrc*	pointer to received original message
`in`	*srcSize*	size of the source buffer
`in`	*pDest*	pointer to a buffer for the treated message
`in,out`	*pDestSize*	size of the provide buffer / size of the treated message
`in,out`	*ppDSPointer*	pointer to pointer to cached dataset set NULL if not used, set content NULL if unknown

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
TRDP_PARAM_ERR	Parameter error

Parameters

`in`	*pRefCon*	pointer to user context
`in`	*dsId*	Data set id to identify the structure out of a configuration
`in`	*pSrc*	pointer to received original message
`in`	*srcSize*	size of the source buffer
`in`	*pDest*	pointer to a buffer for the treated message
`in,out`	*pDestSize*	size of the provide buffer / size of the treated message
`in,out`	*ppDSPointer*	pointer to pointer to cached dataset set NULL if not used, set content NULL if unknown

Return values

TRDP_INIT_ERR	marshalling not initialised
TRDP_NO_ERR	no error
TRDP_MEM_ERR	provided buffer to small
TRDP_PARAM_ERR	Parameter error
TRDP_STATE_ERR	Too deep recursion
TRDP_COMID_ERR	comid not existing
TRDP_MARSHALLING_ERR	dataset/source size mismatch

5.10.2.6 tau_unmarshall()

```
EXT_DECL TRDP_ERR_T tau_unmarshall (
             void * pRefCon,
             UINT32 comId,
             UINT8 * pSrc,
             UINT32 srcSize,
             UINT8 * pDest,
             UINT32 * pDestSize,
             TRDP_DATASET_T ** ppDSPointer )
```

unmarshall function.

Parameters

in	*pRefCon*	pointer to user context
in	*comId*	ComId to identify the structure out of a configuration
in	*pSrc*	pointer to received original message
in	*srcSize*	size of the source buffer
in	*pDest*	pointer to a buffer for the treated message
in,out	*pDestSize*	size of the provide buffer / size of the treated message
in,out	*ppDSPointer*	pointer to pointer to cached dataset set NULL if not used, set content NULL if unknown

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

Parameters

in	*pRefCon*	pointer to user context
in	*comId*	ComId to identify the structure out of a configuration
in	*pSrc*	pointer to received original message
in	*srcSize*	size of the source buffer
in	*pDest*	pointer to a buffer for the treated message
in,out	*pDestSize*	size of the provide buffer / size of the treated message
in,out	*ppDSPointer*	pointer to pointer to cached dataset set NULL if not used, set content NULL if unknown

Return values

TRDP_INIT_ERR	marshalling not initialised
TRDP_NO_ERR	no error
TRDP_MEM_ERR	provided buffer to small
TRDP_PARAM_ERR	Parameter error
TRDP_STATE_ERR	Too deep recursion
TRDP_COMID_ERR	comid not existing
TRDP_MARSHALLING_ERR	dataset/source size mismatch

5.10.2.7 tau_unmarshallDs()

```
EXT_DECL TRDP_ERR_T tau_unmarshallDs (
            void * pRefCon,
            UINT32 dsId,
            UINT8 * pSrc,
            UINT32 srcSize,
            UINT8 * pDest,
            UINT32 * pDestSize,
            TRDP_DATASET_T ** ppDSPointer )
```

unmarshall data set function.

Parameters

in	*pRefCon*	pointer to user context
in	*dsId*	Data set id to identify the structure out of a configuration
in	*pSrc*	pointer to received original message
in	*srcSize*	size of the source buffer
in	*pDest*	pointer to a buffer for the treated message
in,out	*pDestSize*	size of the provide buffer / size of the treated message
in,out	*ppDSPointer*	pointer to pointer to cached dataset set NULL if not used, set content NULL if unknown

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

Parameters

in	*pRefCon*	pointer to user context
in	*dsId*	Data set id to identify the structure out of a configuration
in	*pSrc*	pointer to received original message
in	*srcSize*	size of the source buffer
in	*pDest*	pointer to a buffer for the treated message
in,out	*pDestSize*	size of the provide buffer / size of the treated message
in,out	*ppDSPointer*	pointer to pointer to cached dataset set NULL if not used, set content NULL if unknown

Return values

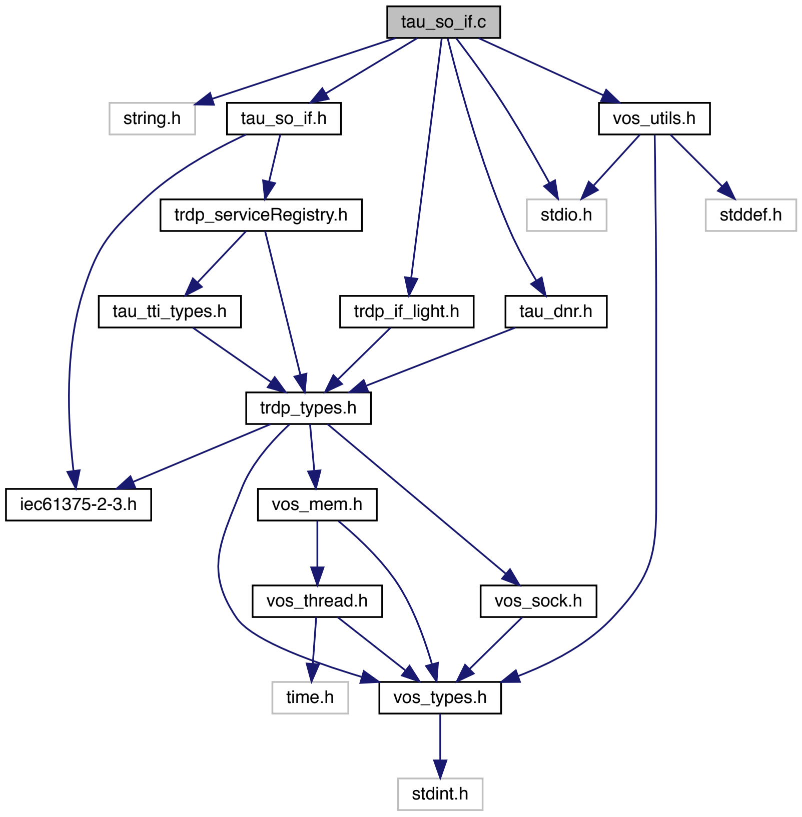
TRDP_INIT_ERR	marshalling not initialised
TRDP_NO_ERR	no error
TRDP_MEM_ERR	provided buffer to small
TRDP_PARAM_ERR	Parameter error
TRDP_STATE_ERR	Too deep recursion
TRDP_COMID_ERR	comid not existing
TRDP_MARSHALLING_ERR	dataset/source size mismatch

5.11 tau_so_if.c File Reference

Access to service oriented functions of the SRM.

```
#include <string.h>
#include <stdio.h>
#include "trdp_if_light.h"
#include "tau_dnr.h"
#include "tau_so_if.h"
#include "vos_utils.h"
```

Include dependency graph for tau_so_if.c:



Functions

- EXT_DECL TRDP_ERR_T tau_addService (TRDP_APP_SESSION_T appHandle, SRM_SERVICE_INFO_T ∗pServiceToAdd, BOOL8 waitForCompletion)

    Function to add to the service registry of the consist-local SRM.
- EXT_DECL TRDP_ERR_T tau_delService (TRDP_APP_SESSION_T appHandle, SRM_SERVICE_INFO_T ∗pServiceToRemove, BOOL8 waitForCompletion)

    Remove the defined service from the service registry of the consist-local SRM.
- EXT_DECL TRDP_ERR_T tau_updService (TRDP_APP_SESSION_T appHandle, SRM_SERVICE_INFO_T ∗pServiceToUpdate, BOOL8 waitForCompletion)

    Register an update a service.

- EXT_DECL TRDP_ERR_T tau_getServicesList (TRDP_APP_SESSION_T appHandle, SRM_SERVICE_↵ ENTRIES_T ∗∗ppServicesListBuffer, UINT32 ∗pNoOfServices)

    Get a list of the services known by the service registry of the local TTDB / SRM.
- EXT_DECL void tau_freeServicesList (SRM_SERVICE_ENTRIES_T ∗pServicesListBuffer)

    Release the memory of a list received by tau_getServiceList.

5.11.1 Detailed Description

Access to service oriented functions of the SRM.

Because of the asynchronous behavior of the TTI subsystem, the source functions (add/upd/del) will return TRD↵ P_NODATA_ERR if called with the the no-wait option.

Note

Project: TCNOpen TRDP prototype stack

Author

B. Loehr (initial version)

Remarks

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5.11.2 Function Documentation

5.11.2.1 tau_addService()

```
EXT_DECL TRDP_ERR_T tau_addService (
            TRDP_APP_SESSION_T appHandle,
            SRM_SERVICE_INFO_T * pServiceToAdd,
            BOOL8 waitForCompletion )
```

Function to add to the service registry of the consist-local SRM.

Note: If waitForCompletion == TRUE, this function will block until completion (or timeout).

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
in,out	*pServiceToAdd*	Pointer to a service registry structure to be set and/or updated (returned)
in	*waitForCompletion*	if true, block for reply

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error
TRDP_NODATA_ERR	Data currently not available, try again later
TRDP_TIMEOUT_ERR	Reply timed out
TRDP_SEMA_ERR	Semaphore could not be aquired

5.11.2.2 tau_delService()

```
EXT_DECL TRDP_ERR_T tau_delService (
            TRDP_APP_SESSION_T appHandle,
            SRM_SERVICE_INFO_T * pServiceToRemove,
            BOOL8 waitForCompletion )
```

Remove the defined service from the service registry of the consist-local SRM.

Note: waitForCompletion is currently ignored, this function does not block.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
in,out	*pServiceToRemove*	Pointer to a service registry structure to be set and/or updated (returned)
in	*waitForCompletion*	if true, block for reply

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error
TRDP_NODATA_ERR	Data currently not available, try again later
TRDP_TIMEOUT_ERR	Reply timed out
TRDP_SEMA_ERR	Semaphore could not be aquired

5.11.2.3 tau_freeServicesList()

```
EXT_DECL void tau_freeServicesList (
            SRM_SERVICE_ENTRIES_T * pServicesListBuffer )
```

Release the memory of a list received by tau_getServiceList.

Parameters

in	*pServicesListBuffer*	Pointer to list aquired by getServiceList.

Return values

none	

5.11.2.4 tau_getServicesList()

```
EXT_DECL TRDP_ERR_T tau_getServicesList (
            TRDP_APP_SESSION_T appHandle,
            SRM_SERVICE_ENTRIES_T ** ppServicesListBuffer,
            UINT32 * pNoOfServices )
```

Get a list of the services known by the service registry of the local TTDB / SRM.

Note: This function will block until completion (or timeout). The buffer must be provided by the caller.

Parameters

`in`	*appHandle*	Handle returned by tlc_openSession().
`out`	*ppServicesListBuffer*	Pointer to pointer containing the list. Has to be vos_memfree'd by user
`out`	*pNoOfServices*	Pointer to no. of services in returned list

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error
TRDP_NODATA_ERR	Data currently not available, try again later
TRDP_TIMEOUT_ERR	Reply timed out

5.11.2.5 tau_updService()

```
EXT_DECL TRDP_ERR_T tau_updService (
            TRDP_APP_SESSION_T appHandle,
            SRM_SERVICE_INFO_T * pServiceToUpdate,
            BOOL8 waitForCompletion )
```

Register an update a service.

Same as addService. Note: If waitForCompletion == TRUE, this function will block until completion (or timeout).

Parameters

`in`	*appHandle*	Handle returned by tlc_openSession().
`in,out`	*pServiceToUpdate*	Pointer to a service registry structure to be updated
`in`	*waitForCompletion*	if true, block for reply

Return values

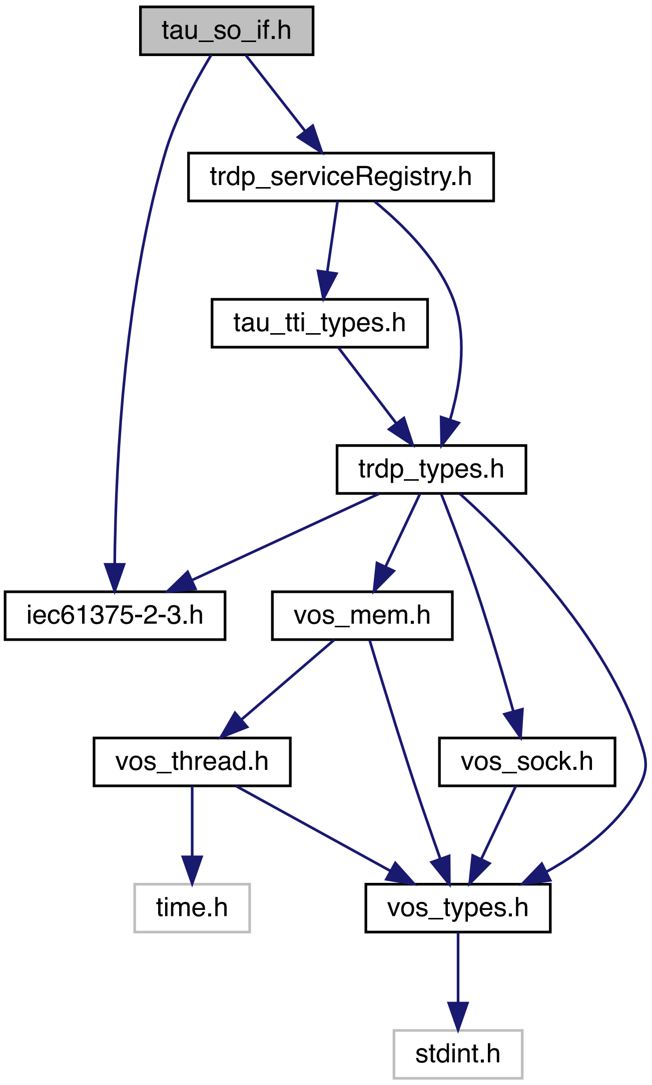
TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error
TRDP_NODATA_ERR	Data currently not available, try again later
TRDP_TIMEOUT_ERR	Reply timed out
TRDP_SEMA_ERR	Semaphore could not be aquired

5.12 tau_so_if.h File Reference

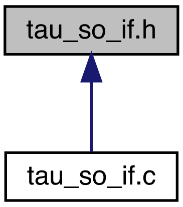
Access to the Service Registry.

```
#include "iec61375-2-3.h"
#include "trdp_serviceRegistry.h"
```

Include dependency graph for tau_so_if.h:



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



Functions

- EXT_DECL TRDP_ERR_T tau_addService (TRDP_APP_SESSION_T appHandle, SRM_SERVICE_INFO_T ∗pServiceToAdd, BOOL8 waitForCompletion)

    Function to add to the service registry of the consist-local SRM.
- EXT_DECL TRDP_ERR_T tau_delService (TRDP_APP_SESSION_T appHandle, SRM_SERVICE_INFO_T ∗pServiceToAdd, BOOL8 waitForCompletion)

    Remove the defined service from the service registry of the consist-local SRM.
- EXT_DECL TRDP_ERR_T tau_updService (TRDP_APP_SESSION_T appHandle, SRM_SERVICE_INFO_T ∗pServiceToAdd, BOOL8 waitForCompletion)

    Register an update a service.
- EXT_DECL TRDP_ERR_T tau_getServicesList (TRDP_APP_SESSION_T appHandle, SRM_SERVICE_↩ ENTRIES_T ∗∗ppServicesToAdd, UINT32 ∗noOfServices)

    Get a list of the services known by the service registry of the local TTDB / SRM.
- EXT_DECL void tau_freeServicesList (SRM_SERVICE_ENTRIES_T ∗pServicesListBuffer)

    Release the memory of a list received by tau_getServiceList.

5.12.1 Detailed Description

Access to the Service Registry.

This header file defines the proposed extensions and additions to access the service interface (proposed as extension to the TTDB defined in IEC61375-2-3:2017

Note

Project: TCNOpen TRDP prototype stack & FDF/DbD

Author

Bernd Loehr, NewTec GmbH, 2019-06-17

Remarks

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Id

tau_so_if.h 2059 2019-08-29 15:47:01Z bloehr

5.12.2 Function Documentation

5.12.2.1 tau_addService()

```
EXT_DECL TRDP_ERR_T tau_addService (
            TRDP_APP_SESSION_T appHandle,
            SRM_SERVICE_INFO_T * pServiceToAdd,
            BOOL8 waitForCompletion )
```

Function to add to the service registry of the consist-local SRM.

Note: If waitForCompletion == TRUE, this function will block until completion (or timeout).

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
in,out	*pServiceToAdd*	Pointer to a service registry structure to be set and/or updated (returned)
in	*waitForCompletion*	if true, block for reply

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error
TRDP_NODATA_ERR	Data currently not available, try again later
TRDP_TIMEOUT_ERR	Reply timed out
TRDP_SEMA_ERR	Semaphore could not be aquired

5.12.2.2 tau_delService()

```
EXT_DECL TRDP_ERR_T tau_delService (
            TRDP_APP_SESSION_T appHandle,
            SRM_SERVICE_INFO_T * pServiceToRemove,
            BOOL8 waitForCompletion )
```

Remove the defined service from the service registry of the consist-local SRM.

Note: waitForCompletion is currently ignored, this function does not block.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
in,out	*pServiceToRemove*	Pointer to a service registry structure to be set and/or updated (returned)
in	*waitForCompletion*	if true, block for reply

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error
TRDP_NODATA_ERR	Data currently not available, try again later
TRDP_TIMEOUT_ERR	Reply timed out
TRDP_SEMA_ERR	Semaphore could not be aquired

5.12.2.3 tau_freeServicesList()

```
EXT_DECL void tau_freeServicesList (
            SRM_SERVICE_ENTRIES_T * pServicesListBuffer )
```

Release the memory of a list received by tau_getServiceList.

Parameters

in	*pServicesListBuffer*	Pointer to list aquired by getServiceList.

Return values

none	

5.12.2.4 tau_getServicesList()

```
EXT_DECL TRDP_ERR_T tau_getServicesList (
            TRDP_APP_SESSION_T appHandle,
            SRM_SERVICE_ENTRIES_T ** ppServicesListBuffer,
            UINT32 * pNoOfServices )
```

Get a list of the services known by the service registry of the local TTDB / SRM.

Note: This function will block until completion (or timeout). The buffer must be provided by the caller.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*ppServicesListBuffer*	Pointer to pointer containing the list. Has to be vos_memfree'd by user
out	*pNoOfServices*	Pointer to no. of services in returned list

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error
TRDP_NODATA_ERR	Data currently not available, try again later
TRDP_TIMEOUT_ERR	Reply timed out

5.12.2.5 tau_updService()

```
EXT_DECL TRDP_ERR_T tau_updService (
            TRDP_APP_SESSION_T appHandle,
            SRM_SERVICE_INFO_T * pServiceToUpdate,
            BOOL8 waitForCompletion )
```

Register an update a service.

Same as addService. Note: If waitForCompletion == TRUE, this function will block until completion (or timeout).

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
in,out	*pServiceToUpdate*	Pointer to a service registry structure to be updated
in	*waitForCompletion*	if true, block for reply

Return values

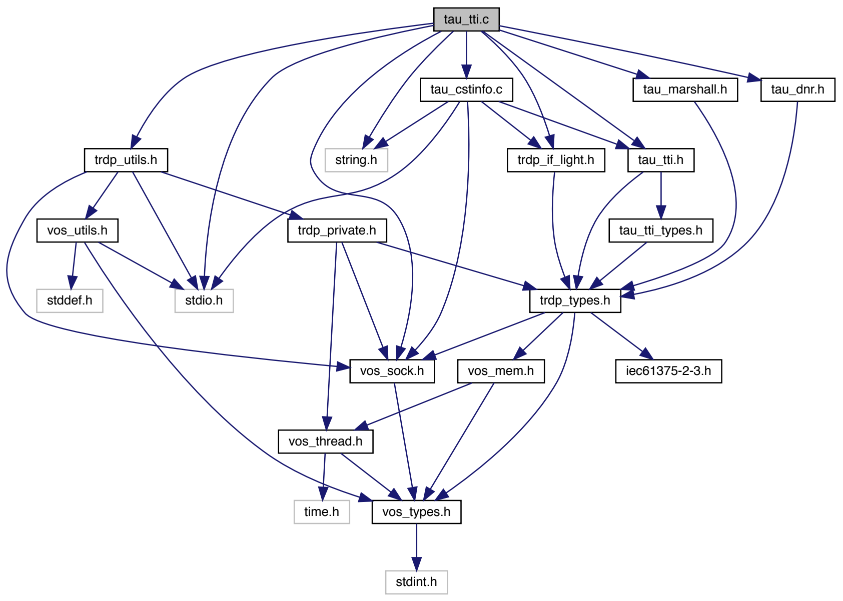
TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error
TRDP_NODATA_ERR	Data currently not available, try again later
TRDP_TIMEOUT_ERR	Reply timed out
TRDP_SEMA_ERR	Semaphore could not be aquired

5.13 tau_tti.c File Reference

Functions for train topology information access.

```
#include <string.h>
#include <stdio.h>
#include "trdp_if_light.h"
#include "trdp_utils.h"
#include "tau_marshall.h"
#include "tau_tti.h"
#include "vos_sock.h"
#include "tau_dnr.h"
#include "tau_cstinfo.c"
```

Include dependency graph for tau_tti.c:



Macros

- #define TTI_CACHED_CONSISTS 8u

  We hold this number of consist infos (ca.

Functions

- EXT_DECL TRDP_ERR_T tau_initTTIaccess (TRDP_APP_SESSION_T appHandle, VOS_SEMA_T user←Action, TRDP_IP_ADDR_T ecspIpAddr, CHAR8 ∗hostsFileName)

  Function to init TTI access.
- EXT_DECL void tau_deInitTTI (TRDP_APP_SESSION_T appHandle)

  Release any resources allocated by TTI Must be called before closing the session.
- EXT_DECL TRDP_ERR_T tau_getOpTrDirectory (TRDP_APP_SESSION_T appHandle, TRDP_OP_TRA←IN_DIR_STATE_T ∗pOpTrnDirState, TRDP_OP_TRAIN_DIR_T ∗pOpTrnDir)

  Function to retrieve the operational train directory state.
- EXT_DECL TRDP_ERR_T tau_getOpTrnDirectoryStatusInfo (TRDP_APP_SESSION_T appHandle, TRD←P_OP_TRAIN_DIR_STATUS_INFO_T ∗pOpTrnDirStatusInfo)

  Function to retrieve the operational train directory state info.
- EXT_DECL TRDP_ERR_T tau_getTrDirectory (TRDP_APP_SESSION_T appHandle, TRDP_TRAIN_DIR←_T ∗pTrnDir)

  Function to retrieve the train directory.
- EXT_DECL TRDP_ERR_T tau_getStaticCstInfo (TRDP_APP_SESSION_T appHandle, TRDP_CONSIST_INFO_T ∗pCstInfo, TRDP_UUID_T const cstUUID)

  Function to retrieve the consist info.
- EXT_DECL TRDP_ERR_T tau_getTTI (TRDP_APP_SESSION_T appHandle, TRDP_OP_TRAIN_DIR_S←TATE_T ∗pOpTrnDirState, TRDP_OP_TRAIN_DIR_T ∗pOpTrnDir, TRDP_TRAIN_DIR_T ∗pTrnDir, TRDP←_TRAIN_NET_DIR_T ∗pTrnNetDir)

  Function to retrieve the operational train directory.

- EXT_DECL TRDP_ERR_T tau_getTrnCstCnt (TRDP_APP_SESSION_T appHandle, UINT16 ∗pTrnCstCnt)

  Function to retrieve the total number of consists in the train.
- EXT_DECL TRDP_ERR_T tau_getTrnVehCnt (TRDP_APP_SESSION_T appHandle, UINT16 ∗pTrnVehCnt)

  Function to retrieve the total number of vehicles in the train.
- EXT_DECL TRDP_ERR_T tau_getCstVehCnt (TRDP_APP_SESSION_T appHandle, UINT16 ∗pCstVehCnt, const TRDP_LABEL_T pCstLabel)

  Function to retrieve the total number of vehicles in a consist.
- EXT_DECL TRDP_ERR_T tau_getCstFctCnt (TRDP_APP_SESSION_T appHandle, UINT16 ∗pCstFctCnt, const TRDP_LABEL_T pCstLabel)

  Function to retrieve the total number of functions in a consist.
- EXT_DECL TRDP_ERR_T tau_getCstFctInfo (TRDP_APP_SESSION_T appHandle, TRDP_FUNCTION_INFO_T ∗pFctInfo, const TRDP_LABEL_T pCstLabel, UINT16 maxFctCnt)

  Function to retrieve the function information of the consist.
- EXT_DECL TRDP_ERR_T tau_getVehInfo (TRDP_APP_SESSION_T appHandle, TRDP_VEHICLE_INFO_T ∗pVehInfo, const TRDP_LABEL_T pVehLabel, const TRDP_LABEL_T pCstLabel)

  Function to retrieve the vehicle information of a consist's vehicle.
- EXT_DECL TRDP_ERR_T tau_getCstInfo (TRDP_APP_SESSION_T appHandle, TRDP_CONSIST_INFO_T ∗pCstInfo, const TRDP_LABEL_T pCstLabel)

  Function to retrieve the consist information of a train's consist.
- EXT_DECL TRDP_ERR_T tau_getVehOrient (TRDP_APP_SESSION_T appHandle, UINT8 ∗pVehOrient, UINT8 ∗pCstOrient, TRDP_LABEL_T pVehLabel, TRDP_LABEL_T pCstLabel)

  Function to retrieve the orientation of the given vehicle.
- EXT_DECL TRDP_ERR_T tau_getOwnIds (TRDP_APP_SESSION_T appHandle, TRDP_LABEL_T ∗p↩ DevId, TRDP_LABEL_T ∗pVehId, TRDP_LABEL_T ∗pCstId)

  Who am I ?.
- EXT_DECL UINT8 tau_getOwnOpCstNo (TRDP_APP_SESSION_T appHandle)

  Get own operational consist number.
- EXT_DECL UINT8 tau_getOwnTrnCstNo (TRDP_APP_SESSION_T appHandle)

  Get own train consist number.

5.13.1 Detailed Description

Functions for train topology information access.

The TTI subsystem maintains a pointer to the TAU_TTDB struct in the TRDP session struct. That TAU_TTDB struct keeps the subscription and listener handles, the current TTDB directories and a pointer list to consist infos (in network format). On init, most TTDB data is requested from the ECSP plus the own consist info. This data is automatically updated if an inauguration is detected. Additional consist infos are requested on demand, only. Because of the asynchronous behavior of the TTI subsystem, most functions in tau_tti.c may return TRDP_N↩ ODATA_ERR on first invocation. They should be called again after 1...3 seconds (3s is the timeout for most MD replies).

Note

Project: TCNOpen TRDP prototype stack

Author

B. Loehr (initial version)

Remarks

5.13.2 Macro Definition Documentation

5.13.2.1 TTI_CACHED_CONSISTS

```
#define TTI_CACHED_CONSISTS 8u
```

We hold this number of consist infos (ca.

105kB)

5.13.3 Function Documentation

5.13.3.1 tau_deInitTTI()

```
EXT_DECL void tau_deInitTTI (
            TRDP_APP_SESSION_T appHandle )
```

Release any resources allocated by TTI Must be called before closing the session.

Function to terminate TTI access.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().

Return values

none	

5.13.3.2 tau_getCstFctCnt()

```
EXT_DECL TRDP_ERR_T tau_getCstFctCnt (
            TRDP_APP_SESSION_T appHandle,
            UINT16 * pCstFctCnt,
            const TRDP_LABEL_T pCstLabel )
```

Function to retrieve the total number of functions in a consist.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pCstFctCnt*	Pointer to the number of functions to be returned
in	*pCstLabel*	Pointer to a consist label. NULL means own consist.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

5.13.3.3 tau_getCstFctInfo()

```
EXT_DECL TRDP_ERR_T tau_getCstFctInfo (
             TRDP_APP_SESSION_T appHandle,
             TRDP_FUNCTION_INFO_T * pFctInfo,
             const TRDP_LABEL_T pCstLabel,
             UINT16 maxFctCnt )
```

Function to retrieve the function information of the consist.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pFctInfo*	Pointer to function info list to be returned. Memory needs to be provided by application. Set NULL if not used.
in	*pCstLabel*	Pointer to a consist label. NULL means own consist.
in	*maxFctCnt*	Maximal number of functions to be returned in provided buffer.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

5.13.3.4 tau_getCstInfo()

```
EXT_DECL TRDP_ERR_T tau_getCstInfo (
             TRDP_APP_SESSION_T appHandle,
             TRDP_CONSIST_INFO_T * pCstInfo,
             const TRDP_LABEL_T pCstLabel )
```

Function to retrieve the consist information of a train's consist.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pCstInfo*	Pointer to the consist info to be returned.
in	*pCstLabel*	Pointer to a consist label. NULL means own consist.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

5.13.3.5 tau_getCstVehCnt()

```
EXT_DECL TRDP_ERR_T tau_getCstVehCnt (
            TRDP_APP_SESSION_T appHandle,
            UINT16 * pCstVehCnt,
            const TRDP_LABEL_T pCstLabel )
```

Function to retrieve the total number of vehicles in a consist.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pCstVehCnt*	Pointer to the number of vehicles to be returned
in	*pCstLabel*	Pointer to a consist label. NULL means own consist.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error
TRDP_NODATA_ERR	Try again

5.13.3.6 tau_getOpTrDirectory()

```
EXT_DECL TRDP_ERR_T tau_getOpTrDirectory (
            TRDP_APP_SESSION_T appHandle,
            TRDP_OP_TRAIN_DIR_STATE_T * pOpTrnDirState,
            TRDP_OP_TRAIN_DIR_T * pOpTrnDir )
```

Function to retrieve the operational train directory state.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pOpTrnDirState*	Pointer to an operational train directory state structure to be returned.
out	*pOpTrnDir*	Pointer to an operational train directory structure to be returned.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error
TRDP_NODATA_ERR	Data currently not available, try again later

5.13.3.7 tau_getOpTrnDirectoryStatusInfo()

```
EXT_DECL TRDP_ERR_T tau_getOpTrnDirectoryStatusInfo (
            TRDP_APP_SESSION_T appHandle,
            TRDP_OP_TRAIN_DIR_STATUS_INFO_T * pOpTrnDirStatusInfo )
```

Function to retrieve the operational train directory state info.

Return a copy of the last received PD 100 telegram. Note: The values are in host endianess! When validating (v2), network endianess must be ensured.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pOpTrnDirStatusInfo*	Pointer to an operational train directory state structure to be returned.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

5.13.3.8 tau_getOwnIds()

```
EXT_DECL TRDP_ERR_T tau_getOwnIds (
            TRDP_APP_SESSION_T appHandle,
            TRDP_LABEL_T * pDevId,
            TRDP_LABEL_T * pVehId,
            TRDP_LABEL_T * pCstId )
```

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

in	*appHandle*	Handle returned by tlc_openSession()
out	*pDevId*	Returns the device label (host name)
out	*pVehId*	Returns the vehicle label
out	*pCstId*	Returns the consist label

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error
TRDP_NODATA_ERR	Data currently not available, call again

5.13.3.9 tau_getOwnOpCstNo()

```
EXT_DECL UINT8 tau_getOwnOpCstNo (
             TRDP_APP_SESSION_T appHandle )
```

Get own operational consist number.

Parameters

in	*appHandle*	The handle returned by tlc_init

Return values

ownOpCstNo	own operational consist number value 0 on error

5.13.3.10 tau_getOwnTrnCstNo()

```
EXT_DECL UINT8 tau_getOwnTrnCstNo (
             TRDP_APP_SESSION_T appHandle )
```

Get own train consist number.

Parameters

in	*appHandle*	The handle returned by tlc_init

Return values

ownTrnCstNo	own train consist number value 0 on error

5.13.3.11 tau_getStaticCstInfo()

```
EXT_DECL TRDP_ERR_T tau_getStaticCstInfo (
             TRDP_APP_SESSION_T appHandle,
             TRDP_CONSIST_INFO_T * pCstInfo,
             TRDP_UUID_T const cstUUID )
```

Function to retrieve the consist info.

Function to retrieve the operational train directory.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pCstInfo*	Pointer to a consist info structure to be returned.
in	*cstUUID*	UUID of the consist the consist info is rquested for.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

5.13.3.12 tau_getTrDirectory()

```
EXT_DECL TRDP_ERR_T tau_getTrDirectory (
            TRDP_APP_SESSION_T appHandle,
            TRDP_TRAIN_DIR_T * pTrnDir )
```

Function to retrieve the train directory.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pTrnDir*	Pointer to a train directory structure to be returned.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error
TRDP_NODATA_ERR	Try later

5.13.3.13 tau_getTrnCstCnt()

```
EXT_DECL TRDP_ERR_T tau_getTrnCstCnt (
            TRDP_APP_SESSION_T appHandle,
            UINT16 * pTrnCstCnt )
```

Function to retrieve the total number of consists in the train.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pTrnCstCnt*	Pointer to the number of consists to be returned

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error
TRDP_NODATA_ERR	Try again

5.13.3.14 tau_getTrnVehCnt()

```
EXT_DECL TRDP_ERR_T tau_getTrnVehCnt (
            TRDP_APP_SESSION_T appHandle,
            UINT16 * pTrnVehCnt )
```

Function to retrieve the total number of vehicles in the train.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pTrnVehCnt*	Pointer to the number of vehicles to be returned

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error
TRDP_NODATA_ERR	Try again

5.13.3.15 tau_getTTI()

```
EXT_DECL TRDP_ERR_T tau_getTTI (
            TRDP_APP_SESSION_T appHandle,
            TRDP_OP_TRAIN_DIR_STATE_T * pOpTrnDirState,
            TRDP_OP_TRAIN_DIR_T * pOpTrnDir,
            TRDP_TRAIN_DIR_T * pTrnDir,
            TRDP_TRAIN_NET_DIR_T * pTrnNetDir )
```

Function to retrieve the operational train directory.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pOpTrnDirState*	Pointer to an operational train directory state structure to be returned.
out	*pOpTrnDir*	Pointer to an operational train directory structure to be returned.
out	*pTrnDir*	Pointer to a train directory structure to be returned.
out	*pTrnNetDir*	Pointer to a train network directory structure to be returned.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

5.13.3.16 tau_getVehInfo()

```
EXT_DECL TRDP_ERR_T tau_getVehInfo (
            TRDP_APP_SESSION_T appHandle,
            TRDP_VEHICLE_INFO_T * pVehInfo,
            const TRDP_LABEL_T pVehLabel,
            const TRDP_LABEL_T pCstLabel )
```

Function to retrieve the vehicle information of a consist's vehicle.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pVehInfo*	Pointer to the vehicle info to be returned.
in	*pVehLabel*	Pointer to a vehicle label. NULL means own vehicle if cstLabel refers to own consist.
in	*pCstLabel*	Pointer to a consist label. NULL means own consist.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

5.13.3.17 tau_getVehOrient()

```
EXT_DECL TRDP_ERR_T tau_getVehOrient (
            TRDP_APP_SESSION_T appHandle,
            UINT8 * pVehOrient,
            UINT8 * pCstOrient,
            TRDP_LABEL_T pVehLabel,
            TRDP_LABEL_T pCstLabel )
```

Function to retrieve the orientation of the given vehicle.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pVehOrient*	Pointer to the vehicle orientation to be returned '00'B = not known (corrected vehicle) '01'B = same as operational train direction '10'B = inverse to operational train direction
out	*pCstOrient*	Pointer to the consist orientation to be returned '00'B = not known (corrected vehicle) '01'B = same as operational train direction '10'B = inverse to operational train direction
in	*pVehLabel*	vehLabel = NULL means own vehicle if cstLabel == NULL, currently ignored.
in	*pCstLabel*	cstLabel = NULL means own consist

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

5.13.3.18 tau_initTTIaccess()

```
EXT_DECL TRDP_ERR_T tau_initTTIaccess (
            TRDP_APP_SESSION_T appHandle,
            VOS_SEMA_T userAction,
            TRDP_IP_ADDR_T ecspIpAddr,
            CHAR8 * hostsFileName )
```

Function to init TTI access.

Subscribe to necessary process data for correct ECSP handling, further calls need DNS!

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
in	*userAction*	Semaphore to fire if inauguration took place.
in	*ecspIpAddr*	ECSP IP address. Currently not used.
in	*hostsFileName*	Optional host file name as ECSP replacement. Currently not implemented.

Return values

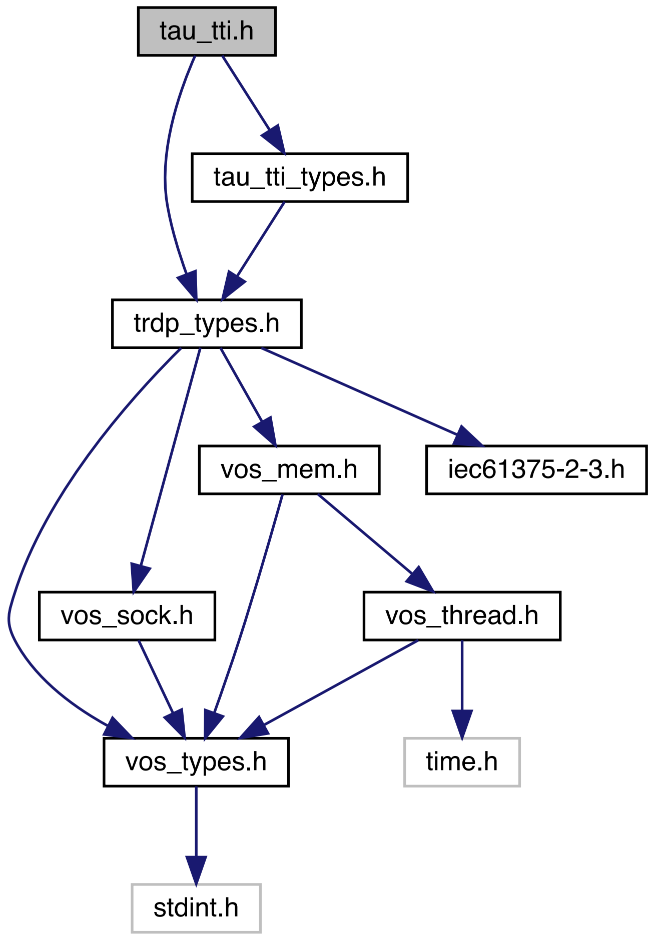
TRDP_NO_ERR	no error
TRDP_INIT_ERR	initialisation error

5.14 tau_tti.h File Reference

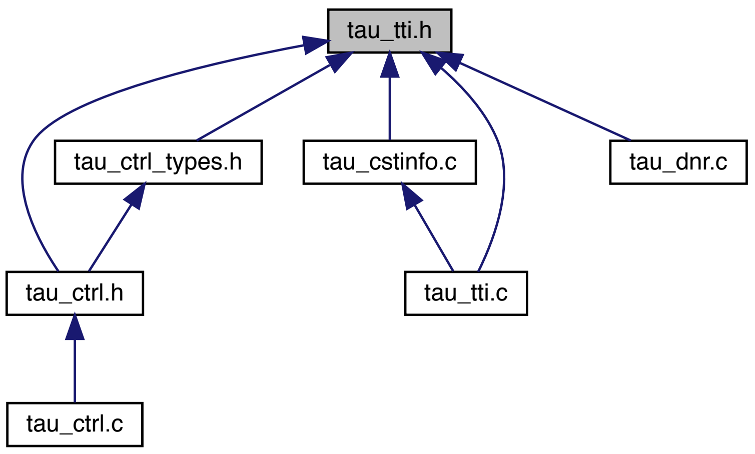
TRDP utility interface definitions.

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

Include dependency graph for tau_tti.h:



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



Functions

- EXT_DECL TRDP_ERR_T tau_initTTIaccess (TRDP_APP_SESSION_T appHandle, VOS_SEMA_T user↩ Action, TRDP_IP_ADDR_T ecspIpAddr, CHAR8 ∗hostsFileName)

  Function to init TTI access.
- EXT_DECL void tau_deInitTTI (TRDP_APP_SESSION_T appHandle)

  Function to terminate TTI access.
- EXT_DECL TRDP_ERR_T tau_getOpTrDirectory (TRDP_APP_SESSION_T appHandle, TRDP_OP_TRA↩ IN_DIR_STATE_T ∗pOpTrnDirState, TRDP_OP_TRAIN_DIR_T ∗pOpTrnDir)

  Function to retrieve the operational train directory state.
- EXT_DECL TRDP_ERR_T tau_getOpTrnDirectoryStatusInfo (TRDP_APP_SESSION_T appHandle, TRD↩ P_OP_TRAIN_DIR_STATUS_INFO_T ∗pOpTrnDirStatusInfo)

  Function to retrieve the operational train directory state info.
- EXT_DECL TRDP_ERR_T tau_getTrDirectory (TRDP_APP_SESSION_T appHandle, TRDP_TRAIN_DIR↩ _T ∗pTrnDir)

  Function to retrieve the train directory.
- EXT_DECL TRDP_ERR_T tau_getStaticCstInfo (TRDP_APP_SESSION_T appHandle, TRDP_CONSIST_INFO_T ∗pCstInfo, TRDP_UUID_T const cstUUID)

  Function to retrieve the operational train directory.
- EXT_DECL TRDP_ERR_T tau_getTTI (TRDP_APP_SESSION_T appHandle, TRDP_OP_TRAIN_DIR_S↩ TATE_T ∗pOpTrnDirState, TRDP_OP_TRAIN_DIR_T ∗pOpTrnDir, TRDP_TRAIN_DIR_T ∗pTrnDir, TRDP↩ _TRAIN_NET_DIR_T ∗pTrnNetDir)

  Function to retrieve the operational train directory.
- EXT_DECL TRDP_ERR_T tau_getTrnCstCnt (TRDP_APP_SESSION_T appHandle, UINT16 ∗pTrnCstCnt)

  Function to retrieve the total number of consists in the train.
- EXT_DECL TRDP_ERR_T tau_getTrnVehCnt (TRDP_APP_SESSION_T appHandle, UINT16 ∗pTrnVehCnt)

  Function to retrieve the total number of vehicles in the train.
- EXT_DECL TRDP_ERR_T tau_getCstVehCnt (TRDP_APP_SESSION_T appHandle, UINT16 ∗pCstVehCnt, const TRDP_LABEL_T pCstLabel)

  Function to retrieve the total number of vehicles in a consist.

- EXT_DECL TRDP_ERR_T tau_getCstFctCnt (TRDP_APP_SESSION_T appHandle, UINT16 ∗pCstFctCnt, const TRDP_LABEL_T pCstLabel)

  Function to retrieve the total number of functions in a consist.
- EXT_DECL TRDP_ERR_T tau_getCstFctInfo (TRDP_APP_SESSION_T appHandle, TRDP_FUNCTION_INFO_T ∗pFctInfo, const TRDP_LABEL_T pCstLabel, UINT16 maxFctCnt)

  Function to retrieve the function information of the consist.
- EXT_DECL TRDP_ERR_T tau_getVehInfo (TRDP_APP_SESSION_T appHandle, TRDP_VEHICLE_INFO_T ∗pVehInfo, const TRDP_LABEL_T pVehLabel, const TRDP_LABEL_T pCstLabel)

  Function to retrieve the vehicle information of a consist's vehicle.
- EXT_DECL TRDP_ERR_T tau_getCstInfo (TRDP_APP_SESSION_T appHandle, TRDP_CONSIST_INFO_T ∗pCstInfo, const TRDP_LABEL_T pCstLabel)

  Function to retrieve the consist information of a train's consist.
- EXT_DECL TRDP_ERR_T tau_getVehOrient (TRDP_APP_SESSION_T appHandle, UINT8 ∗pVehOrient, UINT8 ∗pCstOrient, TRDP_LABEL_T pVehLabel, TRDP_LABEL_T pCstLabel)

  Function to retrieve the orientation of the given vehicle.
- EXT_DECL TRDP_ERR_T tau_getOwnIds (TRDP_APP_SESSION_T appHandle, TRDP_LABEL_T ∗p←DevId, TRDP_LABEL_T ∗pVehId, TRDP_LABEL_T ∗pCstId)

  Who am I ?.
- EXT_DECL UINT8 tau_getOwnOpCstNo (TRDP_APP_SESSION_T appHandle)

  Get own operational consist number.
- EXT_DECL UINT8 tau_getOwnTrnCstNo (TRDP_APP_SESSION_T appHandle)

  Get own train consist number.

5.14.1 Detailed Description

TRDP utility interface definitions.

This module provides the interface to the following utilities

- train topology information access

Note

Project: TCNOpen TRDP prototype stack

Author

Armin-H. Weiss (initial version)

Remarks

5.14.2 Function Documentation

5.14.2.1 tau_deInitTTI()

```
EXT_DECL void tau_deInitTTI (
            TRDP_APP_SESSION_T appHandle )
```

Function to terminate TTI access.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().

Return values

none	Function to terminate TTI access.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().

Return values

none	

5.14.2.2 tau_getCstFctCnt()

```
EXT_DECL TRDP_ERR_T tau_getCstFctCnt (
             TRDP_APP_SESSION_T appHandle,
             UINT16 * pCstFctCnt,
             const TRDP_LABEL_T pCstLabel )
```

Function to retrieve the total number of functions in a consist.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pCstFctCnt*	Pointer to the number of functions to be returned
in	*pCstLabel*	Pointer to a consist label. NULL means own consist.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

5.14.2.3 tau_getCstFctInfo()

```
EXT_DECL TRDP_ERR_T tau_getCstFctInfo (
             TRDP_APP_SESSION_T appHandle,
             TRDP_FUNCTION_INFO_T * pFctInfo,
             const TRDP_LABEL_T pCstLabel,
             UINT16 maxFctCnt )
```

Function to retrieve the function information of the consist.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pFctInfo*	Pointer to function info list to be returned. Memory needs to be provided by application. Set NULL if not used.
in	*pCstLabel*	Pointer to a consist label. NULL means own consist.
in	*maxFctCnt*	Maximal number of functions to be returned in provided buffer.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

5.14.2.4 tau_getCstInfo()

```
EXT_DECL TRDP_ERR_T tau_getCstInfo (
            TRDP_APP_SESSION_T appHandle,
            TRDP_CONSIST_INFO_T * pCstInfo,
            const TRDP_LABEL_T pCstLabel )
```

Function to retrieve the consist information of a train's consist.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pCstInfo*	Pointer to the consist info to be returned.
in	*pCstLabel*	Pointer to a consist label. NULL means own consist.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

5.14.2.5 tau_getCstVehCnt()

```
EXT_DECL TRDP_ERR_T tau_getCstVehCnt (
            TRDP_APP_SESSION_T appHandle,
            UINT16 * pCstVehCnt,
            const TRDP_LABEL_T pCstLabel )
```

Function to retrieve the total number of vehicles in a consist.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pCstVehCnt*	Pointer to the number of vehicles to be returned
in	*pCstLabel*	Pointer to a consist label. NULL means own consist.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pCstVehCnt*	Pointer to the number of vehicles to be returned
in	*pCstLabel*	Pointer to a consist label. NULL means own consist.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error
TRDP_NODATA_ERR	Try again

5.14.2.6 tau_getOpTrDirectory()

```
EXT_DECL TRDP_ERR_T tau_getOpTrDirectory (
            TRDP_APP_SESSION_T appHandle,
            TRDP_OP_TRAIN_DIR_STATE_T * pOpTrnDirState,
            TRDP_OP_TRAIN_DIR_T * pOpTrnDir )
```

Function to retrieve the operational train directory state.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pOpTrnDirState*	Pointer to an operational train directory state structure to be returned.
out	*pOpTrnDir*	Pointer to an operational train directory structure to be returned.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pOpTrnDirState*	Pointer to an operational train directory state structure to be returned.
out	*pOpTrnDir*	Pointer to an operational train directory structure to be returned.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error
TRDP_NODATA_ERR	Data currently not available, try again later

5.14.2.7 tau_getOpTrnDirectoryStatusInfo()

```
EXT_DECL TRDP_ERR_T tau_getOpTrnDirectoryStatusInfo (
            TRDP_APP_SESSION_T appHandle,
            TRDP_OP_TRAIN_DIR_STATUS_INFO_T * pOpTrnDirStatusInfo )
```

Function to retrieve the operational train directory state info.

Return a copy of the last received PD 100 telegram. Note: The values are in host endianess! When validating (SDTv2), network endianess must be ensured.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pOpTrnDirStatusInfo*	Pointer to an operational train directory state structure to be returned.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

Return a copy of the last received PD 100 telegram. Note: The values are in host endianess! When validating (v2), network endianess must be ensured.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pOpTrnDirStatusInfo*	Pointer to an operational train directory state structure to be returned.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

5.14.2.8 tau_getOwnIds()

```
EXT_DECL TRDP_ERR_T tau_getOwnIds (
            TRDP_APP_SESSION_T appHandle,
            TRDP_LABEL_T * pDevId,
            TRDP_LABEL_T * pVehId,
            TRDP_LABEL_T * pCstId )
```

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

in	*appHandle*	Handle returned by tlc_openSession()
out	*pDevId*	Returns the device label (host name)
out	*pVehId*	Returns the vehicle label
out	*pCstId*	Returns the consist label

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error
TRDP_NODATA_ERR	Data currently not available, call again

5.14.2.9 tau_getOwnOpCstNo()

```
EXT_DECL UINT8 tau_getOwnOpCstNo (
            TRDP_APP_SESSION_T appHandle )
```

Get own operational consist number.

Parameters

in	*appHandle*	The handle returned by tlc_init

Return values

ownOpCstNo	own operational consist number value 0 on error

5.14.2.10 tau_getOwnTrnCstNo()

```
EXT_DECL UINT8 tau_getOwnTrnCstNo (
            TRDP_APP_SESSION_T appHandle )
```

Get own train consist number.

Parameters

in	*appHandle*	The handle returned by tlc_init

Return values

ownTrnCstNo	own train consist number value 0 on error

5.14.2.11 tau_getStaticCstInfo()

```
EXT_DECL TRDP_ERR_T tau_getStaticCstInfo (
            TRDP_APP_SESSION_T appHandle,
            TRDP_CONSIST_INFO_T * pCstInfo,
            TRDP_UUID_T const cstUUID )
```

Function to retrieve the operational train directory.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pCstInfo*	Pointer to a consist info structure to be returned.
in	*cstUUID*	UUID of the consist the consist info is rquested for.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

Function to retrieve the operational train directory.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pCstInfo*	Pointer to a consist info structure to be returned.
in	*cstUUID*	UUID of the consist the consist info is rquested for.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

5.14.2.12 tau_getTrDirectory()

```
EXT_DECL TRDP_ERR_T tau_getTrDirectory (
            TRDP_APP_SESSION_T appHandle,
            TRDP_TRAIN_DIR_T * pTrnDir )
```

Function to retrieve the train directory.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pTrnDir*	Pointer to a train directory structure to be returned.

Return values

TRDP_NO_ERR	no error

Return values

TRDP_PARAM_ERR	Parameter error
TRDP_NODATA_ERR	Try later

5.14.2.13 tau_getTrnCstCnt()

```
EXT_DECL TRDP_ERR_T tau_getTrnCstCnt (
            TRDP_APP_SESSION_T appHandle,
            UINT16 * pTrnCstCnt )
```

Function to retrieve the total number of consists in the train.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pTrnCstCnt*	Pointer to the number of consists to be returned

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pTrnCstCnt*	Pointer to the number of consists to be returned

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error
TRDP_NODATA_ERR	Try again

5.14.2.14 tau_getTrnVehCnt()

```
EXT_DECL TRDP_ERR_T tau_getTrnVehCnt (
            TRDP_APP_SESSION_T appHandle,
            UINT16 * pTrnVehCnt )
```

Function to retrieve the total number of vehicles in the train.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pTrnVehCnt*	Pointer to the number of vehicles to be returned

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pTrnVehCnt*	Pointer to the number of vehicles to be returned

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error
TRDP_NODATA_ERR	Try again

5.14.2.15 tau_getTTI()

```
EXT_DECL TRDP_ERR_T tau_getTTI (
            TRDP_APP_SESSION_T appHandle,
            TRDP_OP_TRAIN_DIR_STATE_T * pOpTrnDirState,
            TRDP_OP_TRAIN_DIR_T * pOpTrnDir,
            TRDP_TRAIN_DIR_T * pTrnDir,
            TRDP_TRAIN_NET_DIR_T * pTrnNetDir )
```

Function to retrieve the operational train directory.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pOpTrnDirState*	Pointer to an operational train directory state structure to be returned.
out	*pOpTrnDir*	Pointer to an operational train directory structure to be returned.
out	*pTrnDir*	Pointer to a train directory structure to be returned.
out	*pTrnNetDir*	Pointer to a train network directory structure to be returned.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

5.14.2.16 tau_getVehInfo()

```
EXT_DECL TRDP_ERR_T tau_getVehInfo (
            TRDP_APP_SESSION_T appHandle,
            TRDP_VEHICLE_INFO_T * pVehInfo,
            const TRDP_LABEL_T pVehLabel,
            const TRDP_LABEL_T pCstLabel )
```

Function to retrieve the vehicle information of a consist's vehicle.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pVehInfo*	Pointer to the vehicle info to be returned.
in	*pVehLabel*	Pointer to a vehicle label. NULL means own vehicle if cstLabel refers to own consist.
in	*pCstLabel*	Pointer to a consist label. NULL means own consist.

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

5.14.2.17 tau_getVehOrient()

```
EXT_DECL TRDP_ERR_T tau_getVehOrient (
            TRDP_APP_SESSION_T appHandle,
            UINT8 * pVehOrient,
            UINT8 * pCstOrient,
            TRDP_LABEL_T pVehLabel,
            TRDP_LABEL_T pCstLabel )
```

Function to retrieve the orientation of the given vehicle.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pVehOrient*	Pointer to the vehicle orientation to be returned '00'B = not known (corrected vehicle) '01'B = same as operational train direction '10'B = inverse to operational train direction
out	*pCstOrient*	Pointer to the consist orientation to be returned '00'B = not known (corrected vehicle) '01'B = same as operational train direction '10'B = inverse to operational train direction
in	*pVehLabel*	vehLabel = NULL means own vehicle if cstLabel == NULL
in	*pCstLabel*	cstLabel = NULL means own consist

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
out	*pVehOrient*	Pointer to the vehicle orientation to be returned '00'B = not known (corrected vehicle) '01'B = same as operational train direction '10'B = inverse to operational train direction
out	*pCstOrient*	Pointer to the consist orientation to be returned '00'B = not known (corrected vehicle) '01'B = same as operational train direction '10'B = inverse to operational train direction

Parameters

in	*pVehLabel*	vehLabel = NULL means own vehicle if cstLabel == NULL, currently ignored.
in	*pCstLabel*	cstLabel = NULL means own consist

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	Parameter error

5.14.2.18 tau_initTTIaccess()

```
EXT_DECL TRDP_ERR_T tau_initTTIaccess (
            TRDP_APP_SESSION_T appHandle,
            VOS_SEMA_T userAction,
            TRDP_IP_ADDR_T ecspIpAddr,
            CHAR8 * hostsFileName )
```

Function to init TTI access.

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
in	*userAction*	Semaphore to fire if inauguration took place.
in	*ecspIpAddr*	ECSP IP address.
in	*hostsFileName*	Optional host file name as ECSP replacement.

Return values

TRDP_NO_ERR	no error
TRDP_INIT_ERR	initialisation error

Subscribe to necessary process data for correct ECSP handling, further calls need DNS!

Parameters

in	*appHandle*	Handle returned by tlc_openSession().
in	*userAction*	Semaphore to fire if inauguration took place.
in	*ecspIpAddr*	ECSP IP address. Currently not used.
in	*hostsFileName*	Optional host file name as ECSP replacement. Currently not implemented.

Return values

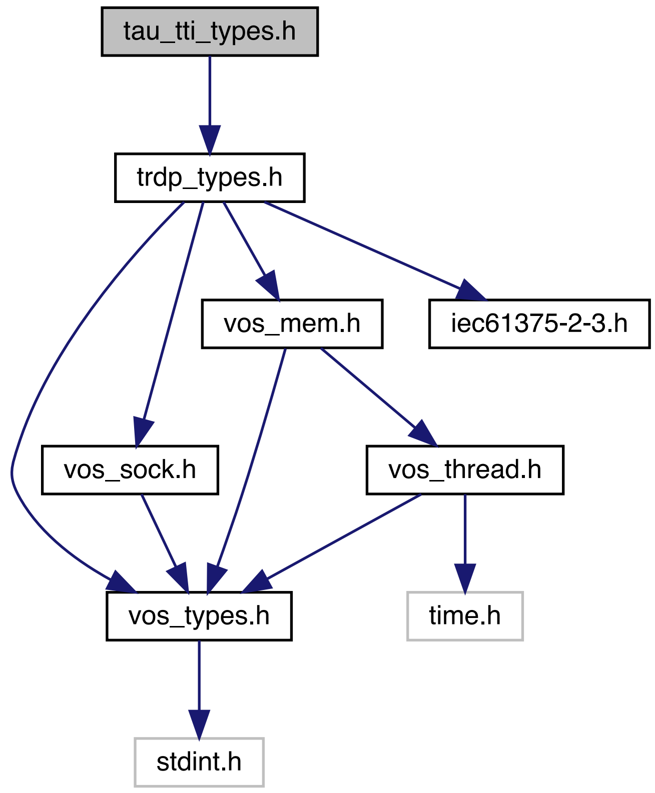
TRDP_NO_ERR	no error
TRDP_INIT_ERR	initialisation error

5.15 tau_tti_types.h File Reference

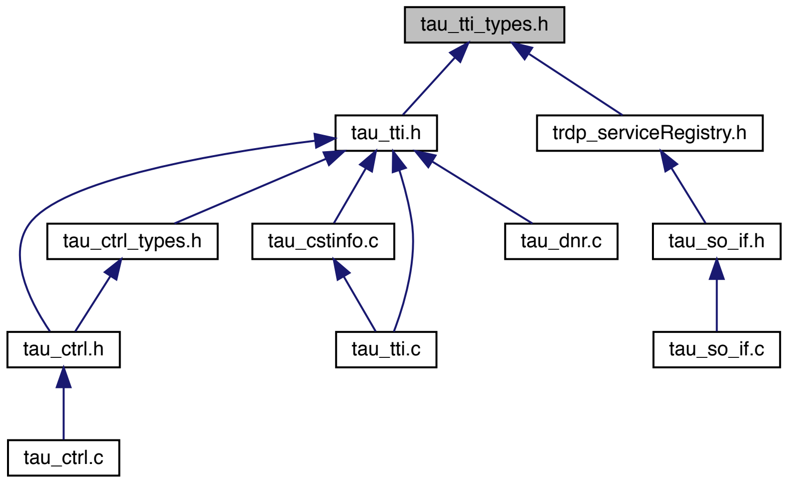
TRDP utility interface definitions.

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

Include dependency graph for tau_tti_types.h:



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



Data Structures

- struct GNU_PACKED

  Types for ETB control.
- struct TRDP_ETB_INFO_T

  Types for train configuration information.
- struct TRDP_CLTR_CST_INFO_T

  Closed train consists information.
- struct TRDP_PROP_T

  Application defined properties.
- struct TRDP_FUNCTION_INFO_T

  function/device information structure
- struct TRDP_VEHICLE_INFO_T

  vehicle information structure
- struct TRDP_CONSIST_INFO_T

  consist information structure
- struct GNU_PACKED

  Types for ETB control.
- struct GNU_PACKED

  Types for ETB control.
- struct GNU_PACKED

  Types for ETB control.
- struct GNU_PACKED

  Types for ETB control.
- struct GNU_PACKED

  Types for ETB control.
- struct GNU_PACKED

  Types for ETB control.
- struct GNU_PACKED

Types for ETB control.
- struct GNU_PACKED

  Types for ETB control.
- struct GNU_PACKED

  Types for ETB control.
- struct GNU_PACKED

  Types for ETB control.
- struct GNU_PACKED

  Types for ETB control.
- struct GNU_PACKED

  Types for ETB control.

Macros

- #define TRDP_MAX_CST_CNT 63u

  max number of consists per train
- #define TRDP_MAX_VEH_CNT 63u

  max number of vehicles per train

5.15.1 Detailed Description

TRDP utility interface definitions.

This module provides the interface to the following utilities

- train topology information access type definitions acc. to IEC61375-2-3

Note

Project: TCNOpen TRDP prototype stack

Author

Armin-H. Weiss (initial version)

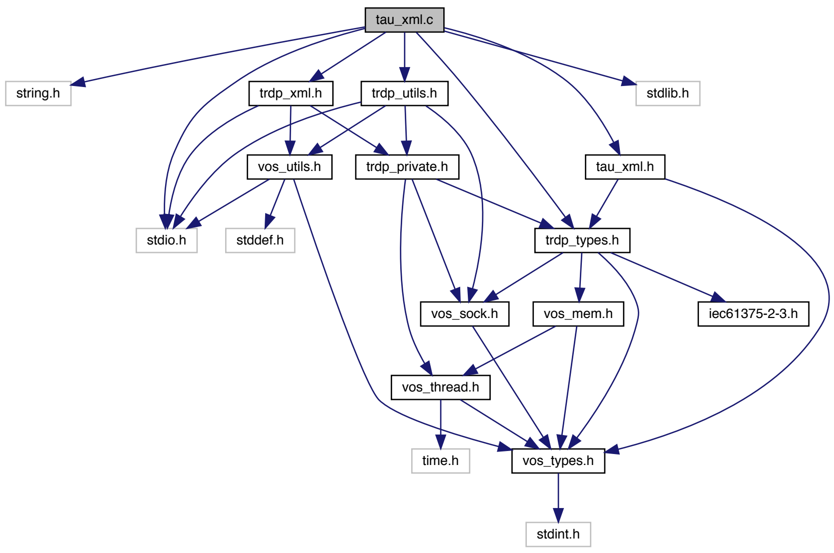
Remarks

5.16 tau_xml.c File Reference

Functions for XML file parsing.

```
#include <string.h>
#include <stdio.h>
#include <stdlib.h>
#include "trdp_types.h"
#include "trdp_utils.h"
#include "tau_xml.h"
#include "trdp_xml.h"
```

Include dependency graph for tau_xml.c:



Macros

- #define TRDP_SDT_DEFAULT_SMI2 0u

  Default SDT safe message identifier.
- #define TRDP_SDT_DEFAULT_NRXSAFE 3u

  Default SDT timeout cycles.
- #define TRDP_SDT_DEFAULT_NGUARD 100u

  Default SDT initial timeout cycles.
- #define TRDP_SDT_DEFAULT_CMTHR 10u

  Default SDT chan.
- #define TRDP_SDT_DEFAULT_LMIMAX (11u∗TRDP_SDT_DEFAULT_NRXSAFE)

  Default SDT chan.

Functions

- EXT_DECL TRDP_ERR_T tau_prepareXmlDoc (const CHAR8 ∗pFileName, TRDP_XML_DOC_HANDLE_T ∗pDocHnd)

  Open XML file, prepare XPath context.

- EXT_DECL TRDP_ERR_T tau_prepareXmlMem (char ∗pBuffer, size_t bufSize, TRDP_XML_DOC_HANDLE_T ∗pDocHnd)

    Open XML stream, prepare XPath context.
- EXT_DECL void tau_freeXmlDoc (TRDP_XML_DOC_HANDLE_T ∗pDocHnd)

    Free all the memory allocated by tau_prepareXmlDoc.
- EXT_DECL TRDP_ERR_T tau_readXmlInterfaceConfig (const TRDP_XML_DOC_HANDLE_T ∗pDocHnd, const CHAR8 ∗pIfName, TRDP_PROCESS_CONFIG_T ∗pProcessConfig, TRDP_PD_CONFIG_T ∗p←PdConfig, TRDP_MD_CONFIG_T ∗pMdConfig, UINT32 ∗pNumExchgPar, TRDP_EXCHG_PAR_T ∗∗pp←ExchgPar)

    Read the interface relevant telegram parameters (except data set configuration) out of the configuration file .
- EXT_DECL void tau_freeTelegrams (UINT32 numExchgPar, TRDP_EXCHG_PAR_T ∗pExchgPar)

    Free array of telegram configurations allocated by tau_readXmlInterfaceConfig.
- EXT_DECL TRDP_ERR_T tau_readXmlDeviceConfig (const TRDP_XML_DOC_HANDLE_T ∗pDocHnd, TRDP_MEM_CONFIG_T ∗pMemConfig, TRDP_DBG_CONFIG_T ∗pDbgConfig, UINT32 ∗pNumComPar, TRDP_COM_PAR_T ∗∗ppComPar, UINT32 ∗pNumIfConfig, TRDP_IF_CONFIG_T ∗∗ppIfConfig)

    Function to read the TRDP device configuration parameters out of the XML configuration file.
- EXT_DECL TRDP_ERR_T tau_readXmlDatasetConfig (const TRDP_XML_DOC_HANDLE_T ∗pDoc←Hnd, UINT32 ∗pNumComId, TRDP_COMID_DSID_MAP_T ∗∗ppComIdDsIdMap, UINT32 ∗pNumDataset, apTRDP_DATASET_T ∗apDataset)

    Function to read the DataSet configuration out of the XML configuration file.
- EXT_DECL void tau_freeXmlDatasetConfig (UINT32 numComId, TRDP_COMID_DSID_MAP_T ∗pComId←DsIdMap, UINT32 numDataset, TRDP_DATASET_T ∗∗ppDataset)

    Function to free the memory for the DataSet configuration.
- EXT_DECL TRDP_ERR_T tau_readXmlServiceConfig (const TRDP_XML_DOC_HANDLE_T ∗pDocHnd, UINT32 ∗pNumServiceDefs, TRDP_SERVICE_DEF_T ∗∗ppServiceDefs)

    Function to read the TRDP device service definitions out of the XML configuration file.

5.16.1 Detailed Description

Functions for XML file parsing.

SOX parsing of XML configuration file

Note

Project: TCNOpen TRDP prototype stack

Author

B. Loehr, NewTec GmbH, Tomas Svoboda, UniControls a.s.

Remarks

5.16.2 Macro Definition Documentation

5.16.2.1 TRDP_SDT_DEFAULT_CMTHR

```
#define TRDP_SDT_DEFAULT_CMTHR 10u
```

Default SDT chan.

monitoring threshold

5.16.2.2 TRDP_SDT_DEFAULT_LMIMAX

```
#define TRDP_SDT_DEFAULT_LMIMAX (11u*TRDP_SDT_DEFAULT_NRXSAFE)
```

Default SDT chan.

latency monitoring cycles

5.16.3 Function Documentation

5.16.3.1 tau_freeTelegrams()

```
EXT_DECL void tau_freeTelegrams (
            UINT32 numExchgPar,
            TRDP_EXCHG_PAR_T * pExchgPar )
```

Free array of telegram configurations allocated by tau_readXmlInterfaceConfig.

Parameters

in	*numExchgPar*	Number of telegram configurations in the array
in	*pExchgPar*	Pointer to array of telegram configurations

5.16.3.2 tau_freeXmlDatasetConfig()

```
EXT_DECL void tau_freeXmlDatasetConfig (
            UINT32 numComId,
            TRDP_COMID_DSID_MAP_T * pComIdDsIdMap,
            UINT32 numDataset,
            TRDP_DATASET_T ** ppDataset )
```

Function to free the memory for the DataSet configuration.

Free the memory for the DataSet configuration which was allocated when parsing the XML configuration file.

Parameters

in	*numComId*	The number of entries in the ComId DatasetId mapping list
in	*pComIdDsIdMap*	Pointer to an array of structures of type TRDP_COMID_DSID_MAP_T
in	*numDataset*	The number of datasets found in the configuration
in	*ppDataset*	Pointer to an array of pointers to a structures of type TRDP_DATASET_T

Return values

none	

5.16.3.3 tau_freeXmlDoc()

```
EXT_DECL void tau_freeXmlDoc (
             TRDP_XML_DOC_HANDLE_T * pDocHnd )
```

Free all the memory allocated by tau_prepareXmlDoc.

Parameters

in	*pDocHnd*	Handle of the parsed XML file

5.16.3.4 tau_prepareXmlDoc()

```
EXT_DECL TRDP_ERR_T tau_prepareXmlDoc (
             const CHAR8 * pFileName,
             TRDP_XML_DOC_HANDLE_T * pDocHnd )
```

Open XML file, prepare XPath context.

Load XML file into DOM tree, prepare XPath context.

Parameters

in	*pFileName*	Path and filename of the xml configuration file
out	*pDocHnd*	Handle of the parsed XML file

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	File does not exist

5.16.3.5 tau_prepareXmlMem()

```
EXT_DECL TRDP_ERR_T tau_prepareXmlMem (
             char * pBuffer,
             size_t bufSize,
             TRDP_XML_DOC_HANDLE_T * pDocHnd )
```

Open XML stream, prepare XPath context.

Parameters

in	*pBuffer*	Pointer to the xml configuration stream buffer
in	*bufSize*	Size of the xml configuration stream buffer
out	*pDocHnd*	Pointer to the handle of the parsed XML file

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	File does not exist

5.16.3.6 tau_readXmlDatasetConfig()

```
EXT_DECL TRDP_ERR_T tau_readXmlDatasetConfig (
             const TRDP_XML_DOC_HANDLE_T * pDocHnd,
             UINT32 * pNumComId,
             TRDP_COMID_DSID_MAP_T ** ppComIdDsIdMap,
             UINT32 * pNumDataset,
             apTRDP_DATASET_T * apDataset )
```

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

Parameters

in	*pDocHnd*	Handle of the XML document prepared by tau_prepareXmlDoc
out	*pNumComId*	Pointer to the number of entries in the ComId DatasetId mapping list
out	*ppComIdDsIdMap*	Pointer to an array of a structures of type TRDP_COMID_DSID_MAP_T
out	*pNumDataset*	Pointer to the number of datasets found in the configuration
out	*apDataset*	Pointer to an array of pointers to a structure 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

5.16.3.7 tau_readXmlDeviceConfig()

```
EXT_DECL TRDP_ERR_T tau_readXmlDeviceConfig (
             const TRDP_XML_DOC_HANDLE_T * pDocHnd,
             TRDP_MEM_CONFIG_T * pMemConfig,
             TRDP_DBG_CONFIG_T * pDbgConfig,
             UINT32 * pNumComPar,
             TRDP_COM_PAR_T ** ppComPar,
             UINT32 * pNumIfConfig,
             TRDP_IF_CONFIG_T ** ppIfConfig )
```

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

The user must release the memory for ppComPar and ppIfConfig (using vos_memFree)

Parameters

in	*pDocHnd*	Handle of the XML document prepared by tau_prepareXmlDoc
out	*pMemConfig*	Memory configuration
out	*pDbgConfig*	Debug printout configuration for application use
out	*pNumComPar*	Number of configured com parameters
out	*ppComPar*	Pointer to array of com parameters
out	*pNumIfConfig*	Number of configured interfaces
out	*ppIfConfig*	Pointer to an array of interface parameter sets

Return values

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

5.16.3.8 tau_readXmlInterfaceConfig()

```
EXT_DECL TRDP_ERR_T tau_readXmlInterfaceConfig (
             const TRDP_XML_DOC_HANDLE_T * pDocHnd,
             const CHAR8 * pIfName,
             TRDP_PROCESS_CONFIG_T * pProcessConfig,
             TRDP_PD_CONFIG_T * pPdConfig,
             TRDP_MD_CONFIG_T * pMdConfig,
             UINT32 * pNumExchgPar,
             TRDP_EXCHG_PAR_T ** ppExchgPar )
```

Read the interface relevant telegram parameters (except data set configuration) out of the configuration file .

Parameters

in	*pDocHnd*	Handle of the XML document prepared by tau_prepareXmlDoc
in	*pIfName*	Interface name
out	*pProcessConfig*	TRDP process (session) configuration for the interface
out	*pPdConfig*	PD default configuration for the interface
out	*pMdConfig*	MD default configuration for the interface
out	*pNumExchgPar*	Number of configured telegrams
out	*ppExchgPar*	Pointer to array of telegram configurations

Return values

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

5.16.3.9 tau_readXmlServiceConfig()

```
EXT_DECL TRDP_ERR_T tau_readXmlServiceConfig (
            const TRDP_XML_DOC_HANDLE_T * pDocHnd,
            UINT32 * pNumServiceDefs,
            TRDP_SERVICE_DEF_T ** ppServiceDefs )
```

Function to read the TRDP device service definitions out of the XML configuration file.

The user must release the memory for pServiceDefs (using vos_memFree)

Parameters

in	*pDocHnd*	Handle of the XML document prepared by tau_prepareXmlDoc
out	*pNumServiceDefs*	Pointer to number of defined Services
out	*ppServiceDefs*	Pointer to pointer of the defined Services

Return values

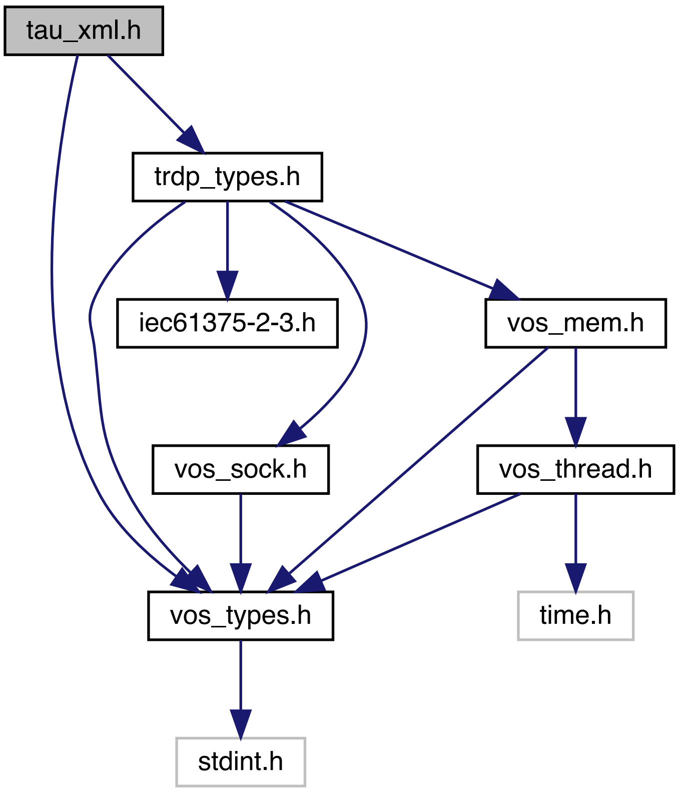
TRDP_NO_ERR	no error
TRDP_MEM_ERR	provided buffer to small
TRDP_PARAM_ERR	File not existing

5.17 tau_xml.h File Reference

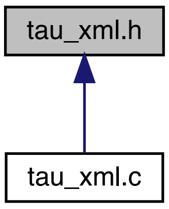
TRDP utility interface definitions.

```
#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_SDT_PAR_T

  Types to read out the XML configuration.

- struct TRDP_DBG_CONFIG_T

  Control for debug output device/file on application level.
- struct TRDP_XML_DOC_HANDLE_T

  Parsed XML document handle.

Macros

- #define TRDP_DBG_DEFAULT 0,

  Control for debug output format on application level.
- #define TRDP_DBG_OFF 0x01

  Printout off.
- #define TRDP_DBG_ERR 0x02

  Printout error.
- #define TRDP_DBG_WARN 0x04

  Printout warning and error.
- #define TRDP_DBG_INFO 0x08

  Printout info, warning and error.
- #define TRDP_DBG_DBG 0x10

  Printout debug, info, warning and error.
- #define TRDP_DBG_TIME 0x20

  Printout timestamp.
- #define TRDP_DBG_LOC 0x40

  Printout file name and line.
- #define TRDP_DBG_CAT 0x80

  Printout category (DBG, INFO, WARN, ERR)

Enumerations

- enum TRDP_EXCHG_OPTION_T {
  TRDP_EXCHG_UNSET = 0,
  TRDP_EXCHG_SOURCE = 1,
  TRDP_EXCHG_SINK = 2,
  TRDP_EXCHG_SOURCESINK = 3 }

  Type attribute for telegrams.

Functions

- EXT_DECL TRDP_ERR_T tau_prepareXmlDoc (const CHAR8 ∗pFileName, TRDP_XML_DOC_HANDLE_T ∗pDocHnd)

  Load XML file into DOM tree, prepare XPath context.
- EXT_DECL TRDP_ERR_T tau_prepareXmlMem (char ∗pBuffer, size_t bufSize, TRDP_XML_DOC_HANDLE_T ∗pDocHnd)

  Open XML stream, prepare XPath context.
- EXT_DECL void tau_freeXmlDoc (TRDP_XML_DOC_HANDLE_T ∗pDocHnd)

  Free all the memory allocated by tau_prepareXmlDoc.
- EXT_DECL TRDP_ERR_T tau_readXmlDeviceConfig (const TRDP_XML_DOC_HANDLE_T ∗pDocHnd, TRDP_MEM_CONFIG_T ∗pMemConfig, TRDP_DBG_CONFIG_T ∗pDbgConfig, UINT32 ∗pNumComPar, TRDP_COM_PAR_T ∗∗ppComPar, UINT32 ∗pNumIfConfig, TRDP_IF_CONFIG_T ∗∗ppIfConfig)

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

- EXT_DECL TRDP_ERR_T tau_readXmlInterfaceConfig (const TRDP_XML_DOC_HANDLE_T ∗pDocHnd, const CHAR8 ∗pIfName, TRDP_PROCESS_CONFIG_T ∗pProcessConfig, TRDP_PD_CONFIG_T ∗p↩PdConfig, TRDP_MD_CONFIG_T ∗pMdConfig, UINT32 ∗pNumExchgPar, TRDP_EXCHG_PAR_T ∗∗pp↩ExchgPar)

  Read the interface relevant telegram parameters (except data set configuration) out of the configuration file .
- EXT_DECL TRDP_ERR_T tau_readXmlDatasetConfig (const TRDP_XML_DOC_HANDLE_T ∗pDoc↩Hnd, UINT32 ∗pNumComId, TRDP_COMID_DSID_MAP_T ∗∗ppComIdDsIdMap, UINT32 ∗pNumDataset, papTRDP_DATASET_T papDataset)

  Function to read the DataSet configuration out of the XML configuration file.
- EXT_DECL void tau_freeXmlDatasetConfig (UINT32 numComId, TRDP_COMID_DSID_MAP_T ∗pComId↩DsIdMap, UINT32 numDataset, TRDP_DATASET_T ∗∗ppDataset)

  Function to free the memory for the DataSet configuration.
- EXT_DECL void tau_freeTelegrams (UINT32 numExchgPar, TRDP_EXCHG_PAR_T ∗pExchgPar)

  Free array of telegram configurations allocated by tau_readXmlInterfaceConfig.
- EXT_DECL TRDP_ERR_T tau_readXmlServiceConfig (const TRDP_XML_DOC_HANDLE_T ∗pDocHnd, UINT32 ∗pNumServiceDefs, TRDP_SERVICE_DEF_T ∗∗ppServiceDefs)

  Function to read the TRDP device service definitions out of the XML configuration file.

5.17.1 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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5.17.2 Macro Definition Documentation

5.17.2.1 TRDP_DBG_DEFAULT

```
#define TRDP_DBG_DEFAULT 0,
```

Control for debug output format on application level.

Printout default

5.17.3 Enumeration Type Documentation

5.17.3.1 TRDP_EXCHG_OPTION_T

```
enum TRDP_EXCHG_OPTION_T
```

Type attribute for telegrams.

Enumerator

TRDP_EXCHG_UNSET	default, direction is not defined
TRDP_EXCHG_SOURCE	telegram shall be published
TRDP_EXCHG_SINK	telegram shall be subscribed
TRDP_EXCHG_SOURCESINK	telegram shall be published and subscribed

5.17.4 Function Documentation

5.17.4.1 tau_freeTelegrams()

```
EXT_DECL void tau_freeTelegrams (
             UINT32 numExchgPar,
             TRDP_EXCHG_PAR_T * pExchgPar )
```

Free array of telegram configurations allocated by tau_readXmlInterfaceConfig.

Parameters

in	*numExchgPar*	Number of telegram configurations in the array
in	*pExchgPar*	Pointer to array of telegram configurations

5.17.4.2 tau_freeXmlDatasetConfig()

```
EXT_DECL void tau_freeXmlDatasetConfig (
             UINT32 numComId,
             TRDP_COMID_DSID_MAP_T * pComIdDsIdMap,
             UINT32 numDataset,
             TRDP_DATASET_T ** ppDataset )
```

Function to free the memory for the DataSet configuration.

Free the memory for the DataSet configuration which was allocated when parsing the XML configuration file.

Parameters

in	*numComId*	The number of entries in the ComId DatasetId mapping list
in	*pComIdDsIdMap*	Pointer to an array of structures of type TRDP_COMID_DSID_MAP_T
in	*numDataset*	The number of datasets found in the configuration
in	*ppDataset*	Pointer to an array of pointers to a structures of type TRDP_DATASET_T

Return values

none	

5.17.4.3 tau_freeXmlDoc()

```
EXT_DECL void tau_freeXmlDoc (
             TRDP_XML_DOC_HANDLE_T * pDocHnd )
```

Free all the memory allocated by tau_prepareXmlDoc.

Parameters

in	*pDocHnd*	Handle of the parsed XML file

5.17.4.4 tau_prepareXmlDoc()

```
EXT_DECL TRDP_ERR_T tau_prepareXmlDoc (
             const CHAR8 * pFileName,
             TRDP_XML_DOC_HANDLE_T * pDocHnd )
```

Load XML file into DOM tree, prepare XPath context.

Parameters

in	*pFileName*	Path and filename of the xml configuration file
out	*pDocHnd*	Handle of the parsed XML file

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	File does not exist

Load XML file into DOM tree, prepare XPath context.

Parameters

in	*pFileName*	Path and filename of the xml configuration file
out	*pDocHnd*	Handle of the parsed XML file

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	File does not exist

5.17.4.5 tau_prepareXmlMem()

```
EXT_DECL TRDP_ERR_T tau_prepareXmlMem (
             char * pBuffer,
             size_t bufSize,
             TRDP_XML_DOC_HANDLE_T * pDocHnd )
```

Open XML stream, prepare XPath context.

Parameters

in	*pBuffer*	Pointer to the xml configuration stream buffer
in	*bufSize*	Size of the xml configuration stream buffer
out	*pDocHnd*	Pointer to the handle of the parsed XML file

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	File does not exist

5.17.4.6 tau_readXmlDatasetConfig()

```
EXT_DECL TRDP_ERR_T tau_readXmlDatasetConfig (
             const TRDP_XML_DOC_HANDLE_T * pDocHnd,
             UINT32 * pNumComId,
             TRDP_COMID_DSID_MAP_T ** ppComIdDsIdMap,
             UINT32 * pNumDataset,
             papTRDP_DATASET_T papDataset )
```

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

Parameters

in	*pDocHnd*	Handle of the XML document prepared by tau_prepareXmlDoc
out	*pNumComId*	Pointer to the number of entries in the ComId DatasetId mapping list
out	*ppComIdDsIdMap*	Pointer to an array of a structures of type TRDP_COMID_DSID_MAP_T
out	*pNumDataset*	Pointer to the number of datasets found in the configuration
out	*papDataset*	Pointer to an array of pointers to 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

5.17.4.7 tau_readXmlDeviceConfig()

```
EXT_DECL TRDP_ERR_T tau_readXmlDeviceConfig (
             const TRDP_XML_DOC_HANDLE_T * pDocHnd,
             TRDP_MEM_CONFIG_T * pMemConfig,
             TRDP_DBG_CONFIG_T * pDbgConfig,
             UINT32 * pNumComPar,
             TRDP_COM_PAR_T ** ppComPar,
             UINT32 * pNumIfConfig,
             TRDP_IF_CONFIG_T ** ppIfConfig )
```

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

Parameters

in	*pDocHnd*	Handle of the XML document prepared by tau_prepareXmlDoc
out	*pMemConfig*	Memory configuration
out	*pDbgConfig*	Debug printout configuration for application use
out	*pNumComPar*	Number of configured com parameters
out	*ppComPar*	Pointer to array of com parameters
out	*pNumIfConfig*	Number of configured interfaces
out	*ppIfConfig*	Pointer to an array of interface parameter sets

Return values

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

The user must release the memory for ppComPar and ppIfConfig (using vos_memFree)

Parameters

in	*pDocHnd*	Handle of the XML document prepared by tau_prepareXmlDoc
out	*pMemConfig*	Memory configuration
out	*pDbgConfig*	Debug printout configuration for application use
out	*pNumComPar*	Number of configured com parameters
out	*ppComPar*	Pointer to array of com parameters
out	*pNumIfConfig*	Number of configured interfaces
out	*ppIfConfig*	Pointer to an array of interface parameter sets

Return values

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

5.17.4.8 tau_readXmlInterfaceConfig()

```
EXT_DECL TRDP_ERR_T tau_readXmlInterfaceConfig (
             const TRDP_XML_DOC_HANDLE_T * pDocHnd,
             const CHAR8 * pIfName,
             TRDP_PROCESS_CONFIG_T * pProcessConfig,
             TRDP_PD_CONFIG_T * pPdConfig,
             TRDP_MD_CONFIG_T * pMdConfig,
             UINT32 * pNumExchgPar,
             TRDP_EXCHG_PAR_T ** ppExchgPar )
```

Read the interface relevant telegram parameters (except data set configuration) out of the configuration file .

Parameters

in	*pDocHnd*	Handle of the XML document prepared by tau_prepareXmlDoc
in	*pIfName*	Interface name
out	*pProcessConfig*	TRDP process (session) configuration for the interface
out	*pPdConfig*	PD default configuration for the interface
out	*pMdConfig*	MD default configuration for the interface
out	*pNumExchgPar*	Number of configured telegrams
out	*ppExchgPar*	Pointer to array of telegram configurations

Return values

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

5.17.4.9 tau_readXmlServiceConfig()

```
EXT_DECL TRDP_ERR_T tau_readXmlServiceConfig (
             const TRDP_XML_DOC_HANDLE_T * pDocHnd,
             UINT32 * pNumServiceDefs,
             TRDP_SERVICE_DEF_T ** ppServiceDefs )
```

Function to read the TRDP device service definitions out of the XML configuration file.

The user must release the memory for pServiceDefs (using vos_memFree)

Parameters

in	*pDocHnd*	Handle of the XML document prepared by tau_prepareXmlDoc
out	*pNumServiceDefs*	Number of defined Services
out	*ppServiceDefs*	Pointer to pointer of the defined Services

Return values

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

The user must release the memory for pServiceDefs (using vos_memFree)

Parameters

in	*pDocHnd*	Handle of the XML document prepared by tau_prepareXmlDoc
out	*pNumServiceDefs*	Pointer to number of defined Services
out	*ppServiceDefs*	Pointer to pointer of the defined Services

Return values

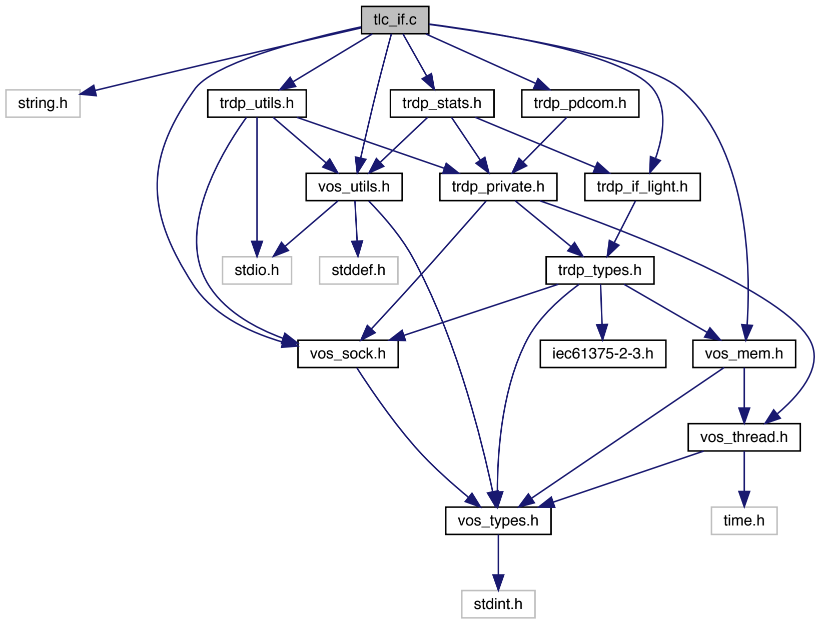
TRDP_NO_ERR	no error
TRDP_MEM_ERR	provided buffer to small
TRDP_PARAM_ERR	File not existing

5.18 tlc_if.c File Reference

Functions for ECN communication.

```
#include <string.h>
#include "trdp_if_light.h"
#include "trdp_utils.h"
#include "trdp_pdcom.h"
#include "trdp_stats.h"
#include "vos_sock.h"
#include "vos_mem.h"
#include "vos_utils.h"
```

Include dependency graph for tlc_if.c:



Functions

- BOOL8 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.
- TRDP_ERR_T trdp_getAccess (TRDP_APP_SESSION_T appHandle, int force)

  Get mutual access to the session Take all mutexes of that session.
- void trdp_releaseAccess (TRDP_APP_SESSION_T appHandle)

  Release access to the session.
- EXT_DECL TRDP_IP_ADDR_T tlc_getOwnIpAddress (TRDP_APP_SESSION_T appHandle)

  Get the interface address.
- EXT_DECL TRDP_ERR_T tlc_init (const TRDP_PRINT_DBG_T pPrintDebugString, void ∗pRefCon, const TRDP_MEM_CONFIG_T ∗pMemConfig)

  Initialize the TRDP stack.
- EXT_DECL TRDP_ERR_T tlc_openSession (TRDP_APP_SESSION_T ∗pAppHandle, TRDP_IP_ADDR_T ownIpAddr, TRDP_IP_ADDR_T leaderIpAddr, const TRDP_MARSHALL_CONFIG_T ∗pMarshall, const TRDP_PD_CONFIG_T ∗pPdDefault, const TRDP_MD_CONFIG_T ∗pMdDefault, const TRDP_PROCESS_CONFIG_T ∗pProcessConfig)

  Open a session with the TRDP stack.
- EXT_DECL TRDP_ERR_T tlc_configSession (TRDP_APP_SESSION_T appHandle, const TRDP_MARSHALL_CONFIG_T ∗pMarshall, const TRDP_PD_CONFIG_T ∗pPdDefault, const TRDP_MD_CONFIG_T ∗pMdDefault, const TRDP_PROCESS_CONFIG_T ∗pProcessConfig)

  (Re-)configure a session.
- EXT_DECL TRDP_ERR_T tlc_updateSession (TRDP_APP_SESSION_T appHandle)

  Update a session.
- EXT_DECL TRDP_ERR_T tlc_closeSession (TRDP_APP_SESSION_T appHandle)

Close a session.
- EXT_DECL TRDP_ERR_T tlc_terminate (void)

  Un-Initialize.
- EXT_DECL TRDP_ERR_T tlc_reinitSession (TRDP_APP_SESSION_T appHandle)

  Re-Initialize.
- 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.
- const char ∗ tlc_getVersionString (void)

  Return a human readable version representation.
- EXT_DECL const TRDP_VERSION_T ∗ tlc_getVersion (void)

  Return version.
- EXT_DECL TRDP_ERR_T tlc_setETBTopoCount (TRDP_APP_SESSION_T appHandle, UINT32 etbTopo←Cnt)

  Set new topocount for trainwide communication.
- EXT_DECL TRDP_ERR_T tlc_setOpTrainTopoCount (TRDP_APP_SESSION_T appHandle, UINT32 op←TrnTopoCnt)

  Set new operational train topocount for direction/orientation sensitive communication.
- EXT_DECL UINT32 tlc_getETBTopoCount (TRDP_APP_SESSION_T appHandle)

  Set new topocount for trainwide communication.
- EXT_DECL UINT32 tlc_getOpTrainTopoCount (TRDP_APP_SESSION_T appHandle)

  Set new operational train topocount for direction/orientation sensitive communication.

5.18.1 Detailed Description

Functions for ECN communication.

API implementation of TRDP Light

Note

Project: TCNOpen TRDP prototype stack

Author

Bernd Loehr, NewTec GmbH

Remarks

5.18.2 Function Documentation

5.18.2.1 tlc_closeSession()

```
EXT_DECL TRDP_ERR_T tlc_closeSession (
            TRDP_APP_SESSION_T appHandle )
```

Close a session.

Clean up and release all resources of that session

Parameters

in	*appHandle*	The handle returned by tlc_openSession

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid
TRDP_PARAM_ERR	handle NULL

5.18.2.2 tlc_configSession()

```
EXT_DECL TRDP_ERR_T tlc_configSession (
            TRDP_APP_SESSION_T appHandle,
            const TRDP_MARSHALL_CONFIG_T * pMarshall,
            const TRDP_PD_CONFIG_T * pPdDefault,
            const TRDP_MD_CONFIG_T * pMdDefault,
            const TRDP_PROCESS_CONFIG_T * pProcessConfig )
```

(Re-)configure a session.

tlc_configSession is called by openSession, but may also be called later on to change the defaults. Only the supplied settings (pointer != NULL) will be evaluated.

Parameters

in	*appHandle*	A handle for further calls to the trdp stack
in	*pMarshall*	Pointer to marshalling configuration
in	*pPdDefault*	Pointer to default PD configuration
in	*pMdDefault*	Pointer to default MD configuration
in	*pProcessConfig*	Pointer to process configuration only option parameter is used here to define session behavior all other parameters are only used to feed statistics

Return values

TRDP_NO_ERR	no error
TRDP_INIT_ERR	not yet inited
TRDP_PARAM_ERR	parameter error

5.18.2.3 tlc_getETBTopoCount()

```
EXT_DECL UINT32 tlc_getETBTopoCount (
            TRDP_APP_SESSION_T appHandle )
```

Set new topocount for trainwide communication.

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

Parameters

in	*appHandle*	the handle returned by tlc_openSession

Return values

etbTopoCnt	

5.18.2.4 tlc_getInterval()

```
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

in	*appHandle*	The handle returned by tlc_openSession
out	*pInterval*	pointer to needed interval
in,out	*pFileDesc*	pointer to file descriptor set
out	*pNoDesc*	pointer to put no of highest used descriptors (for select())

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid

5.18.2.5 tlc_getOpTrainTopoCount()

```
EXT_DECL UINT32 tlc_getOpTrainTopoCount (
             TRDP_APP_SESSION_T appHandle )
```

Set new operational train topocount for direction/orientation sensitive communication.

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

Parameters

in	*appHandle*	The handle returned by tlc_openSession

Return values

opTrnTopoCnt	New operational topocount value

5.18.2.6 tlc_getOwnIpAddress()

```
EXT_DECL TRDP_IP_ADDR_T tlc_getOwnIpAddress (
             TRDP_APP_SESSION_T appHandle )
```

Get the interface address.

Parameters

out	*appHandle*	A handle for further calls to the trdp stack

Return values

real↩ IP	

5.18.2.7 tlc_getVersion()

```
EXT_DECL const TRDP_VERSION_T* tlc_getVersion (
             void  )
```

Return version.

Return pointer to version structure

Return values

TRDP_VERSION↩ _T	

5.18.2.8 tlc_getVersionString()

```
const char* tlc_getVersionString (
             void  )
```

Return a human readable version representation.

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

Return values

const	string

5.18.2.9 tlc_init()

```
EXT_DECL TRDP_ERR_T tlc_init (
             const TRDP_PRINT_DBG_T pPrintDebugString,
             void * pRefCon,
             const TRDP_MEM_CONFIG_T * pMemConfig )
```

Initialize the TRDP stack.

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

tlc_init initializes the memory subsystem and takes a function pointer to an output function for logging.

Parameters

in	*pPrintDebugString*	Pointer to debug print function
in	*pRefCon*	user context
in	*pMemConfig*	Pointer to memory configuration

Return values

TRDP_NO_ERR	no error
TRDP_MEM_ERR	memory allocation failed
TRDP_PARAM_ERR	initialization error

5.18.2.10 tlc_openSession()

```
EXT_DECL TRDP_ERR_T tlc_openSession (
             TRDP_APP_SESSION_T * pAppHandle,
             TRDP_IP_ADDR_T ownIpAddr,
             TRDP_IP_ADDR_T leaderIpAddr,
             const TRDP_MARSHALL_CONFIG_T * pMarshall,
             const TRDP_PD_CONFIG_T * pPdDefault,
             const TRDP_MD_CONFIG_T * pMdDefault,
             const TRDP_PROCESS_CONFIG_T * pProcessConfig )
```

Open a session with the TRDP stack.

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

Parameters

out	*pAppHandle*	A handle for further calls to the trdp stack

Parameters

in	*ownIpAddr*	Own IP address, can be different for each process in multihoming systems, if zero, the default interface / IP will be used.
in	*leaderIpAddr*	IP address of redundancy leader
in	*pMarshall*	Pointer to marshalling configuration
in	*pPdDefault*	Pointer to default PD configuration
in	*pMdDefault*	Pointer to default MD configuration
in	*pProcessConfig*	Pointer to process configuration only option parameter is used here to define session behavior all other parameters are only used to feed statistics

Return values

TRDP_NO_ERR	no error
TRDP_INIT_ERR	not yet inited
TRDP_PARAM_ERR	parameter error
TRDP_SOCK_ERR	socket error

5.18.2.11 tlc_process()

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

Note: If using tlc_process(), do not use tlp_process∗() and tlm_process() calls at the same time! Single thread usage -> use tlc_getInterval(), vos_select(), tlc_process() Multiple threads -> thread 1: use tlp_getInterval(), vos_select(), tlp_processReceive() -> thread 2: cyclically call tlp_processSend() -> thread 3: use tlm_getInterval(), vos_select(), tlm_process() for message data

Also see User Manual.

Parameters

in	*appHandle*	The handle returned by tlc_openSession
in	*pRfds*	pointer to set of ready descriptors
in,out	*pCount*	pointer to number of ready descriptors

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid

5.18.2.12 tlc_reinitSession()

```
EXT_DECL TRDP_ERR_T tlc_reinitSession (
             TRDP_APP_SESSION_T appHandle )
```

Re-Initialize.

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

Parameters

in	*appHandle*	The handle returned by tlc_openSession

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid
TRDP_PARAM_ERR	handle NULL

5.18.2.13 tlc_setETBTopoCount()

```
EXT_DECL TRDP_ERR_T tlc_setETBTopoCount (
             TRDP_APP_SESSION_T appHandle,
             UINT32 etbTopoCnt )
```

Set new topocount for trainwide communication.

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

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*etbTopoCnt*	New etbTopoCnt value

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid

5.18.2.14 tlc_setOpTrainTopoCount()

```
EXT_DECL TRDP_ERR_T tlc_setOpTrainTopoCount (
             TRDP_APP_SESSION_T appHandle,
             UINT32 opTrnTopoCnt )
```

Set new operational train topocount for direction/orientation sensitive communication.

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

Parameters

in	*appHandle*	The handle returned by tlc_openSession
in	*opTrnTopoCnt*	New operational topocount value

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid

5.18.2.15 tlc_terminate()

```
EXT_DECL TRDP_ERR_T tlc_terminate (
             void  )
```

Un-Initialize.

Clean up and close all sessions. Mainly used for debugging/test runs. No further calls to library allowed

Return values

TRDP_NO_ERR	no error
TRDP_INIT_ERR	no error
TRDP_MEM_ERR	TrafficStore nothing
TRDP_MUTEX_ERR	TrafficStore mutex err

5.18.2.16 tlc_updateSession()

```
EXT_DECL TRDP_ERR_T tlc_updateSession (
             TRDP_APP_SESSION_T appHandle )
```

Update a session.

tlc_updateSession signals the end of the set-up phase to the stack. It shall be called after the last publisher and subscriber was added and will create and compute the index tables to be used by the high-performance targets. This function is currently a no-op on standard targets.

Parameters

in	*appHandle*	A handle for further calls to the trdp stack

Return values

TRDP_NO_ERR	no error
TRDP_INIT_ERR	not yet inited
TRDP_PARAM_ERR	parameter error

5.18.2.17 trdp_getAccess()

```
TRDP_ERR_T trdp_getAccess (
             TRDP_APP_SESSION_T appHandle,
             int force )
```

Get mutual access to the session Take all mutexes of that session.

Parameters

in	*appHandle*	A handle for further calls to the trdp stack

Return values

TRDP_NO_ERR	
TRDP_INIT_ERR	
TRDP_MUTEX_ERR	

5.18.2.18 trdp_isValidSession()

```
BOOL8 trdp_isValidSession (
             TRDP_APP_SESSION_T pSessionHandle )
```

Check if the session handle is valid.

Parameters

in	*pSessionHandle*	pointer to packet data (dataset)

Return values

TRUE	is valid
FALSE	is invalid

5.18.2.19 trdp_releaseAccess()

```
void trdp_releaseAccess (
             TRDP_APP_SESSION_T appHandle )
```

Release access to the session.

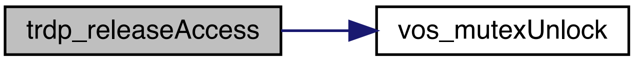
Parameters

in	*appHandle*	A handle for further calls to the trdp stack

Return values

real↩ IP	

Here is the call graph for this function:



5.18.2.20 trdp_sessionQueue()

```
TRDP_APP_SESSION_T * trdp_sessionQueue (
              void  )
```

Get the session queue head pointer.

Return values

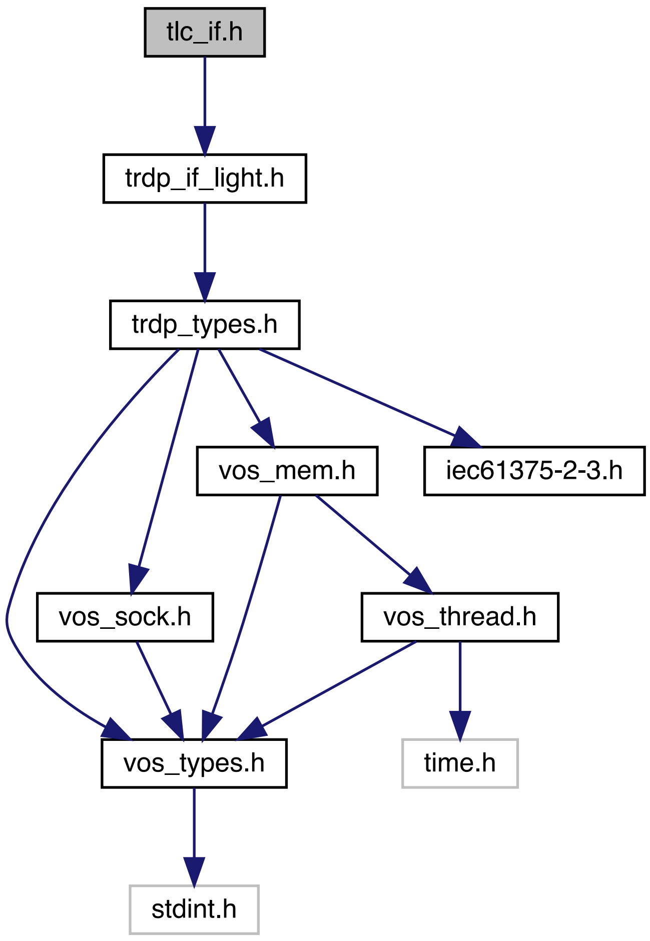
&sSession	

5.19 tlc_if.h File Reference

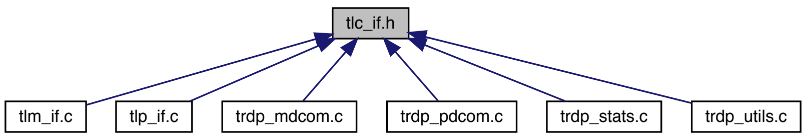
Typedefs for TRDP communication.

`#include "trdp_if_light.h"`

Include dependency graph for tlc_if.h:



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



Functions

- BOOL8 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.

5.19.1 Detailed Description

Typedefs for TRDP communication.

Note

Project: TCNOpen TRDP prototype stack

Author

Bernd Loehr, NewTec GmbH

Remarks

5.19.2 Function Documentation

5.19.2.1 trdp_isValidSession()

```
BOOL8 trdp_isValidSession (
            TRDP_APP_SESSION_T pSessionHandle )
```

Check if the session handle is valid.

Parameters

in	*pSessionHandle*	pointer to packet data (dataset)

Return values

TRUE	is valid
FALSE	is invalid

5.19.2.2 trdp_sessionQueue()

```
TRDP_APP_SESSION_T* trdp_sessionQueue (
            void )
```

Get the session queue head pointer.

Return values

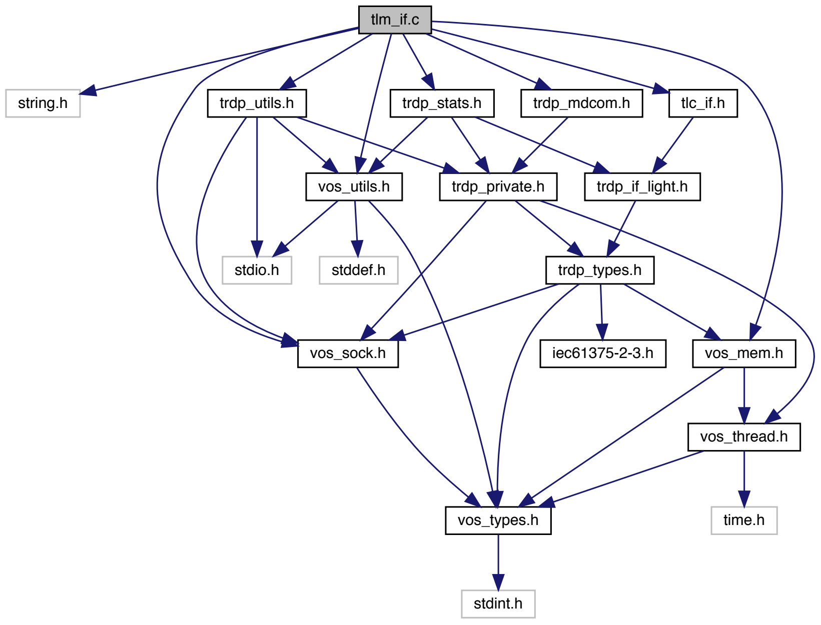
&sSession	

5.20 tlm_if.c File Reference

Functions for Message Data Communication.

```
#include <string.h>
#include "tlc_if.h"
#include "trdp_utils.h"
#include "trdp_mdcom.h"
#include "trdp_stats.h"
#include "vos_sock.h"
#include "vos_mem.h"
#include "vos_utils.h"
```

Include dependency graph for tlm_if.c:



Functions

- EXT_DECL TRDP_ERR_T tlm_getInterval (TRDP_APP_SESSION_T appHandle, TRDP_TIME_T ∗p↩ Interval, TRDP_FDS_T ∗pFileDesc, INT32 ∗pNoDesc)

  Get the lowest time interval for MDs.
- EXT_DECL TRDP_ERR_T tlm_process (TRDP_APP_SESSION_T appHandle, TRDP_FDS_T ∗pRfds, IN↩ T32 ∗pCount)

  Message Data Work loop of the TRDP handler.

- TRDP_ERR_T tlm_notify (TRDP_APP_SESSION_T appHandle, const void ∗pUserRef, TRDP_MD_CALLBACK_T pfCbFunction, UINT32 comId, UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, 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.
- TRDP_ERR_T tlm_request (TRDP_APP_SESSION_T appHandle, const void ∗pUserRef, TRDP_MD_CALLBACK_T pfCbFunction, TRDP_UUID_T ∗pSessionId, UINT32 comId, UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, TRDP_IP_ADDR_T srcIpAddr, TRDP_IP_ADDR_T destIpAddr, TRDP_FLAGS_T pktFlags, UINT32 num↩ Replies, UINT32 replyTimeout, 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 request message.
- EXT_DECL TRDP_ERR_T tlm_addListener (TRDP_APP_SESSION_T appHandle, TRDP_LIS_T ∗pListen↩ Handle, const void ∗pUserRef, TRDP_MD_CALLBACK_T pfCbFunction, BOOL8 comIdListener, UINT32 comId, UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, TRDP_IP_ADDR_T srcIpAddr1, TRDP_IP_ADDR_T srcIpAddr2, TRDP_IP_ADDR_T mcDestIpAddr, TRDP_FLAGS_T pktFlags, const TRDP_URI_USER_↩ T srcURI, const TRDP_URI_USER_T destURI)

  Subscribe to MD messages.
- TRDP_ERR_T tlm_delListener (TRDP_APP_SESSION_T appHandle, TRDP_LIS_T listenHandle)

  Remove Listener.
- EXT_DECL TRDP_ERR_T tlm_readdListener (TRDP_APP_SESSION_T appHandle, TRDP_LIS_T listen↩ Handle, UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, TRDP_IP_ADDR_T srcIpAddr1, TRDP_IP_ADDR_T srcIpAddr2, TRDP_IP_ADDR_T mcDestIpAddr)

  Resubscribe to MD messages.
- TRDP_ERR_T tlm_reply (TRDP_APP_SESSION_T appHandle, const TRDP_UUID_T ∗pSessionId, UINT32 comId, UINT16 userStatus, const TRDP_SEND_PARAM_T ∗pSendParam, const UINT8 ∗pData, UINT32 dataSize)

  Send a MD reply message.
- TRDP_ERR_T tlm_replyQuery (TRDP_APP_SESSION_T appHandle, const TRDP_UUID_T ∗pSessionId, UINT32 comId, UINT16 userStatus, UINT32 confirmTimeout, const TRDP_SEND_PARAM_T ∗pSendParam, const UINT8 ∗pData, UINT32 dataSize)

  Send a MD reply query message.
- TRDP_ERR_T tlm_confirm (TRDP_APP_SESSION_T appHandle, const TRDP_UUID_T ∗pSessionId, UI↩ NT16 userStatus, const TRDP_SEND_PARAM_T ∗pSendParam)

  Initiate sending MD confirm message.
- EXT_DECL TRDP_ERR_T tlm_abortSession (TRDP_APP_SESSION_T appHandle, const TRDP_UUID_T ∗pSessionId)

  Cancel an open session.

5.20.1 Detailed Description

Functions for Message Data Communication.

API implementation of TRDP Light

Note

Project: TCNOpen TRDP prototype stack

Author

Bernd Loehr, NewTec GmbH

Remarks

5.20.2 Function Documentation

5.20.2.1 tlm_abortSession()

```
EXT_DECL TRDP_ERR_T tlm_abortSession (
             TRDP_APP_SESSION_T appHandle,
             const TRDP_UUID_T * pSessionId )
```

Cancel an open session.

Abort an open session; any pending messages will be dropped

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*p↩ SessionId*	Session ID returned by request

Return values

TRDP_NO_ERR	no error
TRDP_NOSESSION_ERR	no such session
TRDP_NOINIT_ERR	handle invalid

5.20.2.2 tlm_addListener()

```
EXT_DECL TRDP_ERR_T tlm_addListener (
             TRDP_APP_SESSION_T appHandle,
             TRDP_LIS_T * pListenHandle,
             const void * pUserRef,
             TRDP_MD_CALLBACK_T pfCbFunction,
             BOOL8 comIdListener,
             UINT32 comId,
             UINT32 etbTopoCnt,
             UINT32 opTrnTopoCnt,
             TRDP_IP_ADDR_T srcIpAddr1,
             TRDP_IP_ADDR_T srcIpAddr2,
             TRDP_IP_ADDR_T mcDestIpAddr,
             TRDP_FLAGS_T pktFlags,
             const TRDP_URI_USER_T srcURI,
             const TRDP_URI_USER_T destURI )
```

Subscribe to MD messages.

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

Parameters

in	*appHandle*	the handle returned by tlc_openSession
out	*pListenHandle*	Handle for this listener returned
in	*pUserRef*	user supplied value returned with received message
in	*pfCbFunction*	Pointer to listener specific callback function, NULL to use default function
in	*comIdListener*	set TRUE if comId shall be observed
in	*comId*	comId to be observed
in	*etbTopoCnt*	ETB topocount to use, 0 if consist local communication
in	*opTrnTopoCnt*	operational topocount, != 0 for orientation/direction sensitive communication
in	*srcIpAddr1*	Source IP address, lower address in case of address range, set to 0 if not used
in	*srcIpAddr2*	upper address in case of address range, set to 0 if not used
in	*mcDestIpAddr*	multicast group to listen on
in	*pktFlags*	OPTION: TRDP_FLAGS_DEFAULT, TRDP_FLAGS_MARSHALL
in	*srcURI*	only functional group of source URI, set to NULL if not used
in	*destURI*	only functional group of destination URI, set to NULL if not used

Return values

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

5.20.2.3 tlm_confirm()

```
TRDP_ERR_T tlm_confirm (
            TRDP_APP_SESSION_T appHandle,
            const TRDP_UUID_T * pSessionId,
            UINT16 userStatus,
            const TRDP_SEND_PARAM_T * pSendParam )
```

Initiate sending MD confirm message.

Send a MD confirmation message User reference, source and destination IP addresses as well as topo counts and packet flags are taken from the session

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*pSessionId*	Session ID returned by request
in	*userStatus*	Info for requester about application errors
in	*pSendParam*	Pointer to send parameters, NULL to use default send parameters

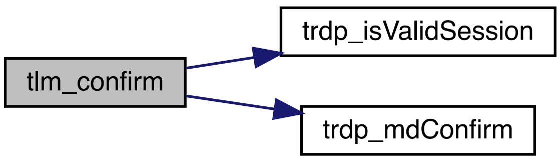
Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	parameter error

Return values

TRDP_MEM_ERR	out of memory
TRDP_NOSESSION_ERR	no such session
TRDP_NOINIT_ERR	handle invalid

Here is the call graph for this function:



5.20.2.4 tlm_delListener()

```
TRDP_ERR_T tlm_delListener (
            TRDP_APP_SESSION_T appHandle,
            TRDP_LIS_T listenHandle )
```

Remove Listener.

Parameters

in	*appHandle*	the handle returned by tlc_openSession
out	*listenHandle*	Handle for this listener

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	parameter error
TRDP_NOINIT_ERR	handle invalid

5.20.2.5 tlm_getInterval()

```
EXT_DECL TRDP_ERR_T tlm_getInterval (
            TRDP_APP_SESSION_T appHandle,
            TRDP_TIME_T * pInterval,
            TRDP_FDS_T * pFileDesc,
            INT32 * pNoDesc )
```

Get the lowest time interval for MDs.

Return the maximum time interval suitable for 'select()' so that we can report time outs to the higher layer.

Parameters

in	*appHandle*	The handle returned by tlc_openSession
out	*pInterval*	pointer to needed interval
in,out	*pFileDesc*	pointer to file descriptor set
out	*pNoDesc*	pointer to put no of highest used descriptors (for select())

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid

5.20.2.6 tlm_notify()

```
TRDP_ERR_T tlm_notify (
            TRDP_APP_SESSION_T appHandle,
            const void * pUserRef,
            TRDP_MD_CALLBACK_T pfCbFunction,
            UINT32 comId,
            UINT32 etbTopoCnt,
            UINT32 opTrnTopoCnt,
            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

in	*appHandle*	the handle returned by tlc_openSession
in	*pUserRef*	user supplied value returned with reply
in	*pfCbFunction*	Pointer to listener specific callback function, NULL to use default function
in	*comId*	comId of packet to be sent
in	*etbTopoCnt*	ETB topocount to use, 0 if consist local communication
in	*opTrnTopoCnt*	operational topocount, != 0 for orientation/direction sensitive communication
in	*srcIpAddr*	own IP address, 0 - srcIP will be set by the stack
in	*destIpAddr*	where to send the packet to

Parameters

in	*pktFlags*	OPTION: TRDP_FLAGS_DEFAULT, TRDP_FLAGS_NONE, TRDP_FLAGS_MARSHALL, TRDP_FLAGS_CALLBACK
in	*pSendParam*	optional pointer to send parameter, NULL - default parameters are used
in	*pData*	pointer to packet data / dataset
in	*dataSize*	size of packet data
in	*sourceURI*	only functional group of source URI
in	*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

5.20.2.7 tlm_process()

```
EXT_DECL TRDP_ERR_T tlm_process (
            TRDP_APP_SESSION_T appHandle,
            TRDP_FDS_T * pRfds,
            INT32 * pCount )
```

Message Data Work loop of the TRDP handler.

Search the queue for pending MDs to be sent Search the receive queue for pending MDs (replies, time outs) and incoming requests

Parameters

in	*appHandle*	The handle returned by tlc_openSession
in	*pRfds*	pointer to set of ready descriptors
in,out	*pCount*	pointer to number of ready descriptors

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid

5.20.2.8 tlm_readdListener()

```
EXT_DECL TRDP_ERR_T tlm_readdListener (
            TRDP_APP_SESSION_T appHandle,
            TRDP_LIS_T listenHandle,
            UINT32 etbTopoCnt,
            UINT32 opTrnTopoCnt,
            TRDP_IP_ADDR_T srcIpAddr1,
            TRDP_IP_ADDR_T srcIpAddr2,
            TRDP_IP_ADDR_T mcDestIpAddr )
```

Resubscribe to MD messages.

Readd a listener after topoCount changes to get notified when messages are received

Parameters

in	*appHandle*	the handle returned by tlc_openSession
out	*listenHandle*	Handle for this listener
in	*etbTopoCnt*	ETB topocount to use, 0 if consist local communication
in	*opTrnTopoCnt*	operational topocount, != 0 for orientation/direction sensitive communication
in	*srcIpAddr1*	Source IP address, lower address in case of address range, set to 0 if not used
in	*srcIpAddr2*	upper address in case of address range, set to 0 if not used
in	*mcDestIpAddr*	multicast group to listen on

Return values

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

5.20.2.9 tlm_reply()

```
TRDP_ERR_T tlm_reply (
            TRDP_APP_SESSION_T appHandle,
            const TRDP_UUID_T * pSessionId,
            UINT32 comId,
            UINT16 userStatus,
            const TRDP_SEND_PARAM_T * pSendParam,
            const UINT8 * pData,
            UINT32 dataSize )
```

Send a MD reply message.

Send a MD reply message after receiving an request User reference, source and destination IP addresses as well as topo counts and packet flags are taken from the session

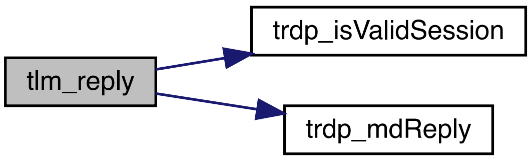
Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*pSessionId*	Session ID returned by indication
in	*comId*	comId of packet to be sent
in	*userStatus*	Info for requester about application errors
in	*pSendParam*	Pointer to send parameters, NULL to use default send parameters
in	*pData*	pointer to packet data / dataset
in	*dataSize*	size of packet data

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

Here is the call graph for this function:



5.20.2.10 tlm_replyQuery()

```
TRDP_ERR_T tlm_replyQuery (
             TRDP_APP_SESSION_T appHandle,
             const TRDP_UUID_T * pSessionId,
             UINT32 comId,
             UINT16 userStatus,
             UINT32 confirmTimeout,
             const TRDP_SEND_PARAM_T * pSendParam,
             const UINT8 * pData,
             UINT32 dataSize )
```

Send a MD reply query message.

Send a MD reply query message after receiving a request and ask for confirmation. User reference, source and destination IP addresses as well as topo counts and packet flags are taken from the session

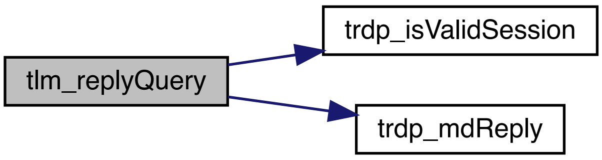
Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*pSessionId*	Session ID returned by indication
in	*comId*	comId of packet to be sent
in	*userStatus*	Info for requester about application errors
in	*confirmTimeout*	timeout for confirmation
in	*pSendParam*	Pointer to send parameters, NULL to use default send parameters
in	*pData*	pointer to packet data / dataset
in	*dataSize*	size of packet data

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

Here is the call graph for this function:



5.20.2.11 tlm_request()

```
TRDP_ERR_T tlm_request (
             TRDP_APP_SESSION_T appHandle,
             const void * pUserRef,
             TRDP_MD_CALLBACK_T pfCbFunction,
             TRDP_UUID_T * pSessionId,
             UINT32 comId,
             UINT32 etbTopoCnt,
             UINT32 opTrnTopoCnt,
             TRDP_IP_ADDR_T srcIpAddr,
             TRDP_IP_ADDR_T destIpAddr,
             TRDP_FLAGS_T pktFlags,
             UINT32 numReplies,
             UINT32 replyTimeout,
             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 request message.

Send a MD request message

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*pUserRef*	user supplied value returned with reply

Parameters

in	*pfCbFunction*	Pointer to listener specific callback function, NULL to use default function
out	*pSessionId*	return session ID
in	*comId*	comId of packet to be sent
in	*etbTopoCnt*	ETB topocount to use, 0 if consist local communication
in	*opTrnTopoCnt*	operational topocount, != 0 for orientation/direction sensitive communication
in	*srcIpAddr*	own IP address, 0 - srcIP will be set by the stack
in	*destIpAddr*	where to send the packet to
in	*pktFlags*	OPTION: TRDP_FLAGS_DEFAULT, TRDP_FLAGS_NONE, TRDP_FLAGS_MARSHALL
in	*numReplies*	number of expected replies, 0 if unknown
in	*replyTimeout*	timeout for reply
in	*pSendParam*	Pointer to send parameters, NULL to use default send parameters
in	*pData*	pointer to packet data / dataset
in	*dataSize*	size of packet data
in	*sourceURI*	only functional group of source URI
in	*destURI*	only functional group of destination URI

Return values

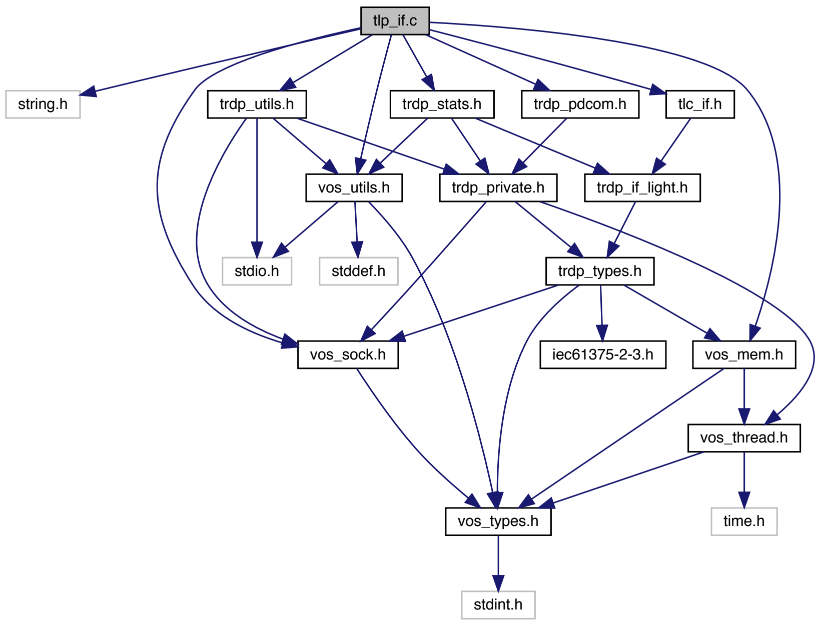
TRDP_NO_ERR	no error
TRDP_PARAM_ERR	parameter error
TRDP_MEM_ERR	out of memory
TRDP_NOINIT_ERR	handle invalid

5.21 tlp_if.c File Reference

Functions for Process Data Communication.

```
#include <string.h>
#include "tlc_if.h"
#include "trdp_utils.h"
#include "trdp_pdcom.h"
#include "trdp_stats.h"
#include "vos_sock.h"
#include "vos_mem.h"
#include "vos_utils.h"
```

Include dependency graph for tlp_if.c:



Functions

- EXT_DECL TRDP_ERR_T tlp_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 tlp_processReceive (TRDP_APP_SESSION_T appHandle, TRDP_FDS_T ∗p←Rfds, INT32 ∗pCount)

  Work loop of the TRDP handler.
- EXT_DECL TRDP_ERR_T tlp_processSend (TRDP_APP_SESSION_T appHandle)

  Work loop of the TRDP handler.
- TRDP_ERR_T tlp_setRedundant (TRDP_APP_SESSION_T appHandle, UINT32 redId, BOOL8 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, BOOL8 ∗pLeader)

  Get status of redundant ComIds.
- EXT_DECL TRDP_ERR_T tlp_publish (TRDP_APP_SESSION_T appHandle, TRDP_PUB_T ∗pPubHandle, const void ∗pUserRef, TRDP_PD_CALLBACK_T pfCbFunction, UINT32 serviceId, UINT32 comId, UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, 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 U←INT8 ∗pData, UINT32 dataSize)

  Prepare for sending PD messages.
- EXT_DECL TRDP_ERR_T tlp_republish (TRDP_APP_SESSION_T appHandle, TRDP_PUB_T pubHandle, UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, TRDP_IP_ADDR_T srcIpAddr, TRDP_IP_ADDR_T destIpAddr)

  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 ∗p←Data, UINT32 dataSize)

Update the process data to send.

- TRDP_ERR_T tlp_putImmediate (TRDP_APP_SESSION_T appHandle, TRDP_PUB_T pubHandle, const UINT8 ∗pData, UINT32 dataSize, VOS_TIMEVAL_T ∗pTxTime)

    Update and send process data.

- EXT_DECL TRDP_ERR_T tlp_request (TRDP_APP_SESSION_T appHandle, TRDP_SUB_T subHandle, UINT32 serviceId, UINT32 comId, UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, TRDP_IP_ADDR_T srcIp←Addr, 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 replyIp←Addr)

    Initiate sending PD messages (PULL).

- EXT_DECL TRDP_ERR_T tlp_subscribe (TRDP_APP_SESSION_T appHandle, TRDP_SUB_T ∗pSub←Handle, const void ∗pUserRef, TRDP_PD_CALLBACK_T pfCbFunction, UINT32 serviceId, UINT32 comId, UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, TRDP_IP_ADDR_T srcIpAddr1, TRDP_IP_ADDR_T srcIp←Addr2, TRDP_IP_ADDR_T destIpAddr, TRDP_FLAGS_T pktFlags, const TRDP_COM_PARAM_T ∗pRec←Params, UINT32 timeout, TRDP_TO_BEHAVIOR_T toBehavior)

    Prepare for receiving PD messages.

- EXT_DECL TRDP_ERR_T tlp_unsubscribe (TRDP_APP_SESSION_T appHandle, TRDP_SUB_T sub←Handle)

    Stop receiving PD messages.

- EXT_DECL TRDP_ERR_T tlp_resubscribe (TRDP_APP_SESSION_T appHandle, TRDP_SUB_T sub←Handle, UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, TRDP_IP_ADDR_T srcIpAddr1, TRDP_IP_ADDR_T srcIpAddr2, TRDP_IP_ADDR_T destIpAddr)

    Reprepare for receiving PD messages.

- EXT_DECL TRDP_ERR_T tlp_get (TRDP_APP_SESSION_T appHandle, TRDP_SUB_T subHandle, TRDP_PD_INFO_T ∗pPdInfo, UINT8 ∗pData, UINT32 ∗pDataSize)

    Get the last valid PD message.

5.21.1 Detailed Description

Functions for Process Data Communication.

API implementation of TRDP Light

Note

Project: TCNOpen TRDP prototype stack

Author

Bernd Loehr, NewTec GmbH

Remarks

5.21.2 Function Documentation

5.21.2.1 tlp_get()

```
EXT_DECL TRDP_ERR_T tlp_get (
            TRDP_APP_SESSION_T appHandle,
            TRDP_SUB_T subHandle,
            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

in	*appHandle*	the handle returned by tlc_openSession
in	*subHandle*	the handle returned by subscription
in,out	*pPdInfo*	pointer to application's info buffer
in,out	*pData*	pointer to application's data buffer
in,out	*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
TRDP_COMID_ERR	ComID not found when marshalling

5.21.2.2 tlp_getInterval()

```
EXT_DECL TRDP_ERR_T tlp_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

in	*appHandle*	The handle returned by tlc_openSession
out	*pInterval*	pointer to needed interval
in,out	*pFileDesc*	pointer to file descriptor set
out	*pNoDesc*	pointer to put no of highest used descriptors (for select())

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid

5.21.2.3 tlp_getRedundant()

```
EXT_DECL TRDP_ERR_T tlp_getRedundant (
             TRDP_APP_SESSION_T appHandle,
             UINT32 redId,
             BOOL8 * pLeader )
```

Get status of redundant ComIds.

Only the status of the first found redundancy group entry will be returned!

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*redId*	will be returned for all ComID's with the given redId
in,out	*pLeader*	TRUE if we're sending this redundancy group (leader)

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	redId invalid or not existing
TRDP_NOINIT_ERR	handle invalid

5.21.2.4 tlp_processReceive()

```
EXT_DECL TRDP_ERR_T tlp_processReceive (
             TRDP_APP_SESSION_T appHandle,
             TRDP_FDS_T * pRfds,
             INT32 * pCount )
```

Work loop of the TRDP handler.

Check the sockets for incoming PD telegrams. Search the receive queue for pending PDs (time out) and report them, either by informing the higher layer via the callback mechanism or just by marking the subscriber as timed-out

Parameters

in	*appHandle*	The handle returned by tlc_openSession
in	*pRfds*	pointer to set of ready descriptors
in,out	*pCount*	pointer to number of ready descriptors

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid

5.21.2.5 tlp_processSend()

```
EXT_DECL TRDP_ERR_T tlp_processSend (
            TRDP_APP_SESSION_T appHandle )
```

Work loop of the TRDP handler.

Search the queue for pending PDs to be sent

Parameters

in	*appHandle*	The handle returned by tlc_openSession

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid

5.21.2.6 tlp_publish()

```
EXT_DECL TRDP_ERR_T tlp_publish (
            TRDP_APP_SESSION_T appHandle,
            TRDP_PUB_T * pPubHandle,
            const void * pUserRef,
            TRDP_PD_CALLBACK_T pfCbFunction,
            UINT32 serviceId,
            UINT32 comId,
            UINT32 etbTopoCnt,
            UINT32 opTrnTopoCnt,
            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 )
```

Prepare for sending PD messages.

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

Parameters

`in`	*appHandle*	the handle returned by tlc_openSession
`out`	*pPubHandle*	returned handle for related re/unpublish
`in`	*pUserRef*	user supplied value returned within the info structure of callback function
`in`	*pfCbFunction*	Pointer to pre-send callback function, NULL if not used
`in`	*serviceId*	optional serviceId this telegram belongs to (default = 0)
`in`	*comId*	comId of packet to send
`in`	*etbTopoCnt*	ETB topocount to use, 0 if consist local communication
`in`	*opTrnTopoCnt*	operational topocount, != 0 for orientation/direction sensitive communication
`in`	*srcIpAddr*	own IP address, 0 - srcIP will be set by the stack
`in`	*destIpAddr*	where to send the packet to
`in`	*interval*	frequency of PD packet (>= 10ms) in usec
`in`	*redId*	0 - Non-redundant, > 0 valid redundancy group
`in`	*pktFlags*	OPTION: TRDP_FLAGS_DEFAULT, TRDP_FLAGS_NONE, TRDP_FLAGS_MARSHALL, TRDP_FLAGS_CALLBACK
`in`	*pSendParam*	optional pointer to send parameter, NULL - default parameters are used
`in`	*pData*	optional pointer to data packet / dataset, NULL if sending starts later with tlp_put()
`in`	*dataSize*	size of data packet >= 0 and <= TRDP_MAX_PD_DATA_SIZE

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

5.21.2.7 tlp_put()

```
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.

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

Parameters

`in`	*appHandle*	the handle returned by tlc_openSession
`in`	*pubHandle*	the handle returned by publish
`in,out`	*pData*	pointer to application's data buffer
`in,out`	*dataSize*	size of data

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	parameter error on uninitialized parameter or changed dataSize compared to published one
TRDP_NOPUB_ERR	not published
TRDP_NOINIT_ERR	handle invalid
TRDP_COMID_ERR	ComID not found when marshalling

5.21.2.8 tlp_putImmediate()

```
TRDP_ERR_T tlp_putImmediate (
            TRDP_APP_SESSION_T appHandle,
            TRDP_PUB_T pubHandle,
            const UINT8 * pData,
            UINT32 dataSize,
            VOS_TIMEVAL_T * pTxTime )
```

Update and send process data.

Update previously published data. The new telegram will be sent immediatly or at txTime, if txTime != 0 and TSN == 1 Should be used if application (or higher layer, e.g. ara::com and acyclic events) needs full control over process data schedule.

Note: For TSN this function is not protected by any mutexes and should not be called while adding or removing any publishers, subscribers or even sessions! Also: Marshalling is not supported!

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*pubHandle*	the handle returned by publish
in,out	*pData*	pointer to application's data buffer
in,out	*dataSize*	size of data
in	*pTxTime*	when to send (absolute time), optional for TSN only

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	parameter error on uninitialized parameter or changed dataSize compared to published one
TRDP_NOPUB_ERR	not published
TRDP_NOINIT_ERR	handle invalid

5.21.2.9 tlp_republish()

```
EXT_DECL TRDP_ERR_T tlp_republish (
            TRDP_APP_SESSION_T appHandle,
            TRDP_PUB_T pubHandle,
            UINT32 etbTopoCnt,
            UINT32 opTrnTopoCnt,
            TRDP_IP_ADDR_T srcIpAddr,
            TRDP_IP_ADDR_T destIpAddr )
```

Prepare for sending PD messages.

Reinitialize and queue a PD message, it will be send when tlc_publish has been called

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*pubHandle*	handle for related unpublish
in	*etbTopoCnt*	ETB topocount to use, 0 if consist local communication
in	*opTrnTopoCnt*	operational topocount, != 0 for orientation/direction sensitive communication
in	*srcIpAddr*	own IP address, 0 - srcIP will be set by the stack
in	*destIpAddr*	where to send the packet to

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

5.21.2.10 tlp_request()

```
EXT_DECL TRDP_ERR_T tlp_request (
              TRDP_APP_SESSION_T appHandle,
              TRDP_SUB_T subHandle,
              UINT32 serviceId,
              UINT32 comId,
              UINT32 etbTopoCnt,
              UINT32 opTrnTopoCnt,
              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 )
```

Initiate sending PD messages (PULL).

Send a PD request message

Parameters

in	*appHandle*	the handle returned by tlc_openSession

Parameters

in	*subHandle*	handle from related subscribe
in	*serviceId*	optional serviceId this telegram belongs to (default = 0)
in	*comId*	comId of packet to be sent
in	*etbTopoCnt*	ETB topocount to use, 0 if consist local communication
in	*opTrnTopoCnt*	operational topocount, != 0 for orientation/direction sensitive communication
in	*srcIpAddr*	own IP address, 0 - srcIP will be set by the stack
in	*destIpAddr*	where to send the packet to
in	*redId*	0 - Non-redundant, > 0 valid redundancy group
in	*pktFlags*	OPTION: TRDP_FLAGS_DEFAULT, TRDP_FLAGS_NONE, TRDP_FLAGS_MARSHALL, TRDP_FLAGS_CALLBACK
in	*pSendParam*	optional pointer to send parameter, NULL - default parameters are used
in	*pData*	pointer to packet data / dataset
in	*dataSize*	size of packet data
in	*replyComId*	comId of reply (default comID of subscription)
in	*replyIpAddr*	IP for reply

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_NOSUB_ERR	no matching subscription found

5.21.2.11 tlp_resubscribe()

```
EXT_DECL TRDP_ERR_T tlp_resubscribe (
            TRDP_APP_SESSION_T appHandle,
            TRDP_SUB_T subHandle,
            UINT32 etbTopoCnt,
            UINT32 opTrnTopoCnt,
            TRDP_IP_ADDR_T srcIpAddr1,
            TRDP_IP_ADDR_T srcIpAddr2,
            TRDP_IP_ADDR_T destIpAddr )
```

Reprepare for receiving PD messages.

Resubscribe to a specific PD ComID and source IP

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*subHandle*	handle for this subscription
in	*etbTopoCnt*	ETB topocount to use, 0 if consist local communication
in	*opTrnTopoCnt*	operational topocount, != 0 for orientation/direction sensitive communication
in	*srcIpAddr1*	Source IP address, lower address in case of address range, set to 0 if not used
in	*srcIpAddr2*	upper address in case of address range, set to 0 if not used
in	*destIpAddr*	IP address to join

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
TRDP_SOCK_ERR	Resource (socket) not available, subscription canceled

5.21.2.12 tlp_setRedundant()

```
TRDP_ERR_T tlp_setRedundant (
             TRDP_APP_SESSION_T appHandle,
             UINT32 redId,
             BOOL8 leader )
```

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

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*redId*	will be set for all ComID's with the given redId, 0 to change for all redId
in	*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

5.21.2.13 tlp_subscribe()

```
EXT_DECL TRDP_ERR_T tlp_subscribe (
             TRDP_APP_SESSION_T appHandle,
             TRDP_SUB_T * pSubHandle,
             const void * pUserRef,
             TRDP_PD_CALLBACK_T pfCbFunction,
             UINT32 serviceId,
             UINT32 comId,
             UINT32 etbTopoCnt,
             UINT32 opTrnTopoCnt,
             TRDP_IP_ADDR_T srcIpAddr1,
             TRDP_IP_ADDR_T srcIpAddr2,
             TRDP_IP_ADDR_T destIpAddr,
             TRDP_FLAGS_T pktFlags,
             const TRDP_COM_PARAM_T * pRecParams,
             UINT32 timeout,
             TRDP_TO_BEHAVIOR_T toBehavior )
```

Prepare for receiving PD messages.

Subscribe to a specific PD ComID and source IP.

Parameters

in	*appHandle*	the handle returned by tlc_openSession
out	*pSubHandle*	return a handle for this subscription
in	*pUserRef*	user supplied value returned within the info structure
in	*pfCbFunction*	Pointer to subscriber specific callback function, NULL to use default function
in	*serviceId*	optional serviceId this telegram belongs to (default = 0)
in	*comId*	comId of packet to receive
in	*etbTopoCnt*	ETB topocount to use, 0 if consist local communication
in	*opTrnTopoCnt*	operational topocount, != 0 for orientation/direction sensitive communication
in	*srcIpAddr1*	Source IP address, lower address in case of address range, set to 0 if not used
in	*srcIpAddr2*	upper address in case of address range, set to 0 if not used
in	*destIpAddr*	IP address to join
in	*pktFlags*	OPTION: TRDP_FLAGS_DEFAULT, TRDP_FLAGS_NONE, TRDP_FLAGS_MARSHALL, TRDP_FLAGS_CALLBACK
in	*pRecParams*	optional pointer to send parameter, NULL - default parameters are used
in	*timeout*	timeout (>= 10ms) in usec
in	*toBehavior*	timeout behavior

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

5.21.2.14 tlp_unpublish()

```
TRDP_ERR_T tlp_unpublish (
            TRDP_APP_SESSION_T appHandle,
            TRDP_PUB_T pubHandle )
```

Stop sending PD messages.

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*pubHandle*	the handle returned by prepare

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	parameter error
TRDP_NOPUB_ERR	not published

Return values

TRDP_NOINIT_ERR	handle invalid

5.21.2.15 tlp_unsubscribe()

```
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

in	*appHandle*	the handle returned by tlc_openSession
in	*subHandle*	the handle for this subscription

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	parameter error
TRDP_NOSUB_ERR	not subscribed
TRDP_NOINIT_ERR	handle invalid

5.22 trdp_dllmain.c File Reference

Windows DLL main function.

5.22.1 Detailed Description

Windows DLL main function.

Note

Project: TCNOpen TRDP prototype stack

Author

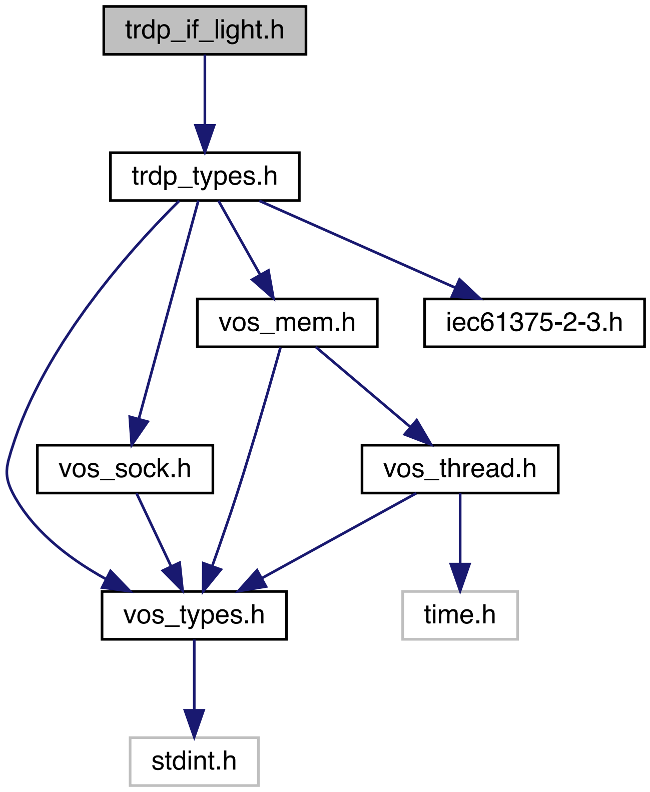
Armin-H. Weiss, Bombardier

Remarks

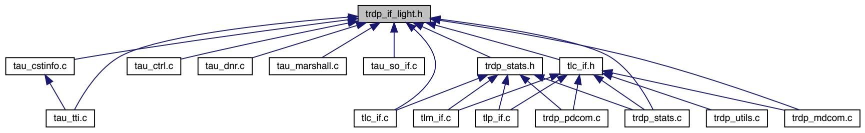
5.23 trdp_if_light.h File Reference

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:



Functions

- EXT_DECL TRDP_ERR_T tlc_init (const TRDP_PRINT_DBG_T pPrintDebugString, void ∗pRefCon, const TRDP_MEM_CONFIG_T ∗pMemConfig)

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

- EXT_DECL TRDP_ERR_T tlc_openSession (TRDP_APP_SESSION_T ∗pAppHandle, TRDP_IP_ADDR_T ownIpAddr, TRDP_IP_ADDR_T leaderIpAddr, const TRDP_MARSHALL_CONFIG_T ∗pMarshall, const TRDP_PD_CONFIG_T ∗pPdDefault, const TRDP_MD_CONFIG_T ∗pMdDefault, const TRDP_PROCESS_CONFIG_T ∗pProcessConfig)

  Open a session with the TRDP stack.
- EXT_DECL TRDP_ERR_T tlc_reinitSession (TRDP_APP_SESSION_T appHandle)

  Re-Initialize.
- EXT_DECL TRDP_ERR_T tlc_configSession (TRDP_APP_SESSION_T appHandle, const TRDP_MARSHALL_CONFIG_T ∗pMarshall, const TRDP_PD_CONFIG_T ∗pPdDefault, const TRDP_MD_CONFIG_T ∗pMdDefault, const TRDP_PROCESS_CONFIG_T ∗pProcessConfig)

  (Re-)configure a session.
- EXT_DECL TRDP_ERR_T tlc_updateSession (TRDP_APP_SESSION_T appHandle)

  Update a session.
- EXT_DECL TRDP_ERR_T tlc_closeSession (TRDP_APP_SESSION_T appHandle)

  Close a session.
- EXT_DECL TRDP_ERR_T tlc_terminate (void)

  Un-Initialize.
- EXT_DECL TRDP_ERR_T tlc_setETBTopoCount (TRDP_APP_SESSION_T appHandle, UINT32 etbTopo←Cnt)

  Set new topocount for trainwide communication.
- EXT_DECL UINT32 tlc_getETBTopoCount (TRDP_APP_SESSION_T appHandle)

  Set new topocount for trainwide communication.
- EXT_DECL TRDP_ERR_T tlc_setOpTrainTopoCount (TRDP_APP_SESSION_T appHandle, UINT32 op←TrnTopoCnt)

  Set new operational train topocount for direction/orientation sensitive communication.
- EXT_DECL UINT32 tlc_getOpTrainTopoCount (TRDP_APP_SESSION_T appHandle)

  Set new operational train topocount for direction/orientation sensitive communication.
- 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_IP_ADDR_T tlc_getOwnIpAddress (TRDP_APP_SESSION_T appHandle)

  Get the interface address.
- EXT_DECL TRDP_ERR_T tlp_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 tlp_processSend (TRDP_APP_SESSION_T appHandle)

  Work loop of the TRDP handler.
- EXT_DECL TRDP_ERR_T tlp_processReceive (TRDP_APP_SESSION_T appHandle, TRDP_FDS_T ∗p←Rfds, INT32 ∗pCount)

  Work loop of the TRDP handler.
- EXT_DECL TRDP_ERR_T tlp_publish (TRDP_APP_SESSION_T appHandle, TRDP_PUB_T ∗pPubHandle, const void ∗pUserRef, TRDP_PD_CALLBACK_T pfCbFunction, UINT32 serviceId, UINT32 comId, UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, 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 U←INT8 ∗pData, UINT32 dataSize)

  Prepare for sending PD messages.
- EXT_DECL TRDP_ERR_T tlp_republish (TRDP_APP_SESSION_T appHandle, TRDP_PUB_T pubHandle, UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, TRDP_IP_ADDR_T srcIpAddr, TRDP_IP_ADDR_T destIpAddr)

  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_putImmediate (TRDP_APP_SESSION_T appHandle, TRDP_PUB_T pub←Handle, const UINT8 ∗pData, UINT32 dataSize, VOS_TIMEVAL_T ∗pTxTime)

  Update and send process data.
- EXT_DECL TRDP_ERR_T tlp_setRedundant (TRDP_APP_SESSION_T appHandle, UINT32 redId, BOOL8 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, BOOL8 ∗pLeader)

  Get status of redundant ComIds.
- EXT_DECL TRDP_ERR_T tlp_request (TRDP_APP_SESSION_T appHandle, TRDP_SUB_T subHandle, UINT32 serviceId, UINT32 comId, UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, TRDP_IP_ADDR_T srcIp←Addr, 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 replyIp←Addr)

  Initiate sending PD messages (PULL).
- EXT_DECL TRDP_ERR_T tlp_subscribe (TRDP_APP_SESSION_T appHandle, TRDP_SUB_T ∗pSub←Handle, const void ∗pUserRef, TRDP_PD_CALLBACK_T pfCbFunction, UINT32 serviceId, UINT32 comId, UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, TRDP_IP_ADDR_T srcIpAddr1, TRDP_IP_ADDR_T srcIp←Addr2, TRDP_IP_ADDR_T destIpAddr, TRDP_FLAGS_T pktFlags, const TRDP_COM_PARAM_T ∗pRec←Params, UINT32 timeout, TRDP_TO_BEHAVIOR_T toBehavior)

  Prepare for receiving PD messages.
- EXT_DECL TRDP_ERR_T tlp_resubscribe (TRDP_APP_SESSION_T appHandle, TRDP_SUB_T sub←Handle, UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, TRDP_IP_ADDR_T srcIpAddr1, TRDP_IP_ADDR_T srcIpAddr2, TRDP_IP_ADDR_T destIpAddr)

  Reprepare for receiving PD messages.
- EXT_DECL TRDP_ERR_T tlp_unsubscribe (TRDP_APP_SESSION_T appHandle, TRDP_SUB_T sub←Handle)

  Stop receiving PD messages.
- EXT_DECL TRDP_ERR_T tlp_get (TRDP_APP_SESSION_T appHandle, TRDP_SUB_T subHandle, TRDP_PD_INFO_T ∗pPdInfo, UINT8 ∗pData, UINT32 ∗pDataSize)

  Get the last valid PD message.
- EXT_DECL TRDP_ERR_T tlm_process (TRDP_APP_SESSION_T appHandle, TRDP_FDS_T ∗pRfds, IN←T32 ∗pCount)

  Message Data Work loop of the TRDP handler.
- EXT_DECL TRDP_ERR_T tlm_getInterval (TRDP_APP_SESSION_T appHandle, TRDP_TIME_T ∗p←Interval, TRDP_FDS_T ∗pFileDesc, INT32 ∗pNoDesc)

  Get the lowest time interval for MDs.
- EXT_DECL TRDP_ERR_T tlm_notify (TRDP_APP_SESSION_T appHandle, const void ∗pUserRef, TRDP_MD_CALLBACK_T pfCbFunction, UINT32 comId, UINT32 etbTopoCnt, UINT32 opTrnTopo←Cnt, 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_USE←R_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_MD_CALLBACK_T pfCbFunction, TRDP_UUID_T ∗pSessionId, UINT32 comId, UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, TRDP_IP_ADDR_T srcIpAddr, TRDP_IP_ADDR_T destIpAddr, TRDP_FLAGS←_T pktFlags, UINT32 numReplies, UINT32 replyTimeout, 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 request message.

- EXT_DECL TRDP_ERR_T tlm_confirm (TRDP_APP_SESSION_T appHandle, const TRDP_UUID_T ∗p↵ SessionId, UINT16 userStatus, const TRDP_SEND_PARAM_T ∗pSendParam)

  Initiate sending MD confirm message.
- EXT_DECL TRDP_ERR_T tlm_abortSession (TRDP_APP_SESSION_T appHandle, const TRDP_UUID_T ∗pSessionId)

  Cancel an open session.
- EXT_DECL TRDP_ERR_T tlm_addListener (TRDP_APP_SESSION_T appHandle, TRDP_LIS_T ∗pListen↵ Handle, const void ∗pUserRef, TRDP_MD_CALLBACK_T pfCbFunction, BOOL8 comIdListener, UINT32 comId, UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, TRDP_IP_ADDR_T srcIpAddr1, TRDP_IP_ADDR_T srcIpAddr2, TRDP_IP_ADDR_T mcDestIpAddr, TRDP_FLAGS_T pktFlags, const TRDP_URI_USER_↵ T srcURI, const TRDP_URI_USER_T destURI)

  Subscribe to MD messages.
- EXT_DECL TRDP_ERR_T tlm_readdListener (TRDP_APP_SESSION_T appHandle, TRDP_LIS_T listen↵ Handle, UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, TRDP_IP_ADDR_T srcIpAddr, TRDP_IP_ADDR_T srcIpAddr2, TRDP_IP_ADDR_T mcDestIpAddr)

  Resubscribe to MD messages.
- EXT_DECL TRDP_ERR_T tlm_delListener (TRDP_APP_SESSION_T appHandle, TRDP_LIS_T listen↵ Handle)

  Remove Listener.
- TRDP_ERR_T tlm_reply (TRDP_APP_SESSION_T appHandle, const TRDP_UUID_T ∗pSessionId, UINT32 comId, UINT16 userStatus, const TRDP_SEND_PARAM_T ∗pSendParam, const UINT8 ∗pData, UINT32 dataSize)

  Send a MD reply message.
- TRDP_ERR_T tlm_replyQuery (TRDP_APP_SESSION_T appHandle, const TRDP_UUID_T ∗pSessionId, UINT32 comId, UINT16 userStatus, UINT32 confirmTimeout, const TRDP_SEND_PARAM_T ∗pSendParam, const UINT8 ∗pData, UINT32 dataSize)

  Send a MD reply query message.
- EXT_DECL const CHAR8 ∗ tlc_getVersionString (void)

  Return a human readable version representation.
- EXT_DECL const TRDP_VERSION_T ∗ tlc_getVersion (void)

  Return version.
- EXT_DECL TRDP_ERR_T tlc_getStatistics (TRDP_APP_SESSION_T appHandle, TRDP_STATISTICS_T ∗pStatistics)

  Return statistics.
- EXT_DECL TRDP_ERR_T tlc_getSubsStatistics (TRDP_APP_SESSION_T appHandle, UINT16 ∗pNum↵ Subs, TRDP_SUBS_STATISTICS_T ∗pStatistics)

  Return PD subscription statistics.
- EXT_DECL TRDP_ERR_T tlc_getPubStatistics (TRDP_APP_SESSION_T appHandle, UINT16 ∗pNumPub, TRDP_PUB_STATISTICS_T ∗pStatistics)

  Return PD publish statistics.
- EXT_DECL TRDP_ERR_T tlc_getRedStatistics (TRDP_APP_SESSION_T appHandle, UINT16 ∗pNumRed, TRDP_RED_STATISTICS_T ∗pStatistics)

  Return redundancy group statistics.
- EXT_DECL TRDP_ERR_T tlc_getJoinStatistics (TRDP_APP_SESSION_T appHandle, UINT16 ∗pNumJoin, UINT32 ∗pIpAddr)

  Return join statistics.
- EXT_DECL TRDP_ERR_T tlc_resetStatistics (TRDP_APP_SESSION_T appHandle)

  Reset statistics.

5.23.1 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

5.23.2 Function Documentation

5.23.2.1 tlc_closeSession()

```
EXT_DECL TRDP_ERR_T tlc_closeSession (
            TRDP_APP_SESSION_T appHandle )
```

Close a session.

Clean up and release all resources of that session

Parameters

in	*appHandle*	The handle returned by tlc_openSession

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid
TRDP_PARAM_ERR	handle NULL

5.23.2.2 tlc_configSession()

```
EXT_DECL TRDP_ERR_T tlc_configSession (
            TRDP_APP_SESSION_T appHandle,
            const TRDP_MARSHALL_CONFIG_T * pMarshall,
            const TRDP_PD_CONFIG_T * pPdDefault,
            const TRDP_MD_CONFIG_T * pMdDefault,
            const TRDP_PROCESS_CONFIG_T * pProcessConfig )
```

(Re-)configure a session.

tlc_configSession is called by openSession, but may also be called later on to change the defaults. Only the supplied settings (pointer != NULL) will be evaluated.

Parameters

in	*appHandle*	A handle for further calls to the trdp stack
in	*pMarshall*	Pointer to marshalling configuration
in	*pPdDefault*	Pointer to default PD configuration
in	*pMdDefault*	Pointer to default MD configuration
in	*pProcessConfig*	Pointer to process configuration only option parameter is used here to define session behavior all other parameters are only used to feed statistics

Return values

TRDP_NO_ERR	no error
TRDP_INIT_ERR	not yet inited
TRDP_PARAM_ERR	parameter error

5.23.2.3 tlc_getETBTopoCount()

```
EXT_DECL UINT32 tlc_getETBTopoCount (
            TRDP_APP_SESSION_T appHandle )
```

Set new topocount for trainwide communication.

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

Parameters

in	*appHandle*	the handle returned by tlc_openSession

Return values

etbTopoCnt	

5.23.2.4 tlc_getInterval()

```
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

in	*appHandle*	The handle returned by tlc_openSession
out	*pInterval*	pointer to needed interval
in,out	*pFileDesc*	pointer to file descriptor set
out	*pNoDesc*	pointer to put no of highest used descriptors (for select())

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid

5.23.2.5 tlc_getJoinStatistics()

```
EXT_DECL TRDP_ERR_T tlc_getJoinStatistics (
            TRDP_APP_SESSION_T appHandle,
            UINT16 * pNumJoin,
            UINT32 * pIpAddr )
```

Return join statistics.

Memory for statistics information must be provided by the user.

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in,out	*pNumJoin*	Pointer to the number of joined IP Adresses
out	*pIpAddr*	Pointer to a list with the joined IP adresses

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid
TRDP_PARAM_ERR	parameter error
TRDP_MEM_ERR	there are more items than requested

5.23.2.6 tlc_getOpTrainTopoCount()

```
EXT_DECL UINT32 tlc_getOpTrainTopoCount (
            TRDP_APP_SESSION_T appHandle )
```

Set new operational train topocount for direction/orientation sensitive communication.

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

Parameters

in	*appHandle*	The handle returned by tlc_openSession

Return values

opTrnTopoCnt	New operational topocount value

5.23.2.7 tlc_getOwnIpAddress()

```
EXT_DECL TRDP_IP_ADDR_T tlc_getOwnIpAddress (
            TRDP_APP_SESSION_T appHandle )
```

Get the interface address.

Parameters

out	*appHandle*	A handle for further calls to the trdp stack

Return values

real←IP	

5.23.2.8 tlc_getPubStatistics()

```
EXT_DECL TRDP_ERR_T tlc_getPubStatistics (
            TRDP_APP_SESSION_T appHandle,
            UINT16 * pNumPub,
            TRDP_PUB_STATISTICS_T * pStatistics )
```

Return PD publish statistics.

Memory for statistics information must be provided by the user.

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in,out	*pNumPub*	Pointer to the number of publishers
out	*pStatistics*	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
TRDP_MEM_ERR	there are more subscriptions than requested

5.23.2.9 tlc_getRedStatistics()

```
EXT_DECL TRDP_ERR_T tlc_getRedStatistics (
            TRDP_APP_SESSION_T appHandle,
            UINT16 * pNumRed,
            TRDP_RED_STATISTICS_T * pStatistics )
```

Return redundancy group statistics.

Memory for statistics information must be provided by the user.

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in,out	*pNumRed*	Pointer to the number of redundancy groups
out	*pStatistics*	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
TRDP_MEM_ERR	there are more subscriptions than requested

5.23.2.10 tlc_getStatistics()

```
EXT_DECL TRDP_ERR_T tlc_getStatistics (
            TRDP_APP_SESSION_T appHandle,
            TRDP_STATISTICS_T * pStatistics )
```

Return statistics.

Memory for statistics information must be provided by the user.

Parameters

in	*appHandle*	the handle returned by tlc_openSession
out	*pStatistics*	Pointer to statistics for this application session

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid
TRDP_PARAM_ERR	parameter error

5.23.2.11 tlc_getSubsStatistics()

```
EXT_DECL TRDP_ERR_T tlc_getSubsStatistics (
             TRDP_APP_SESSION_T appHandle,
             UINT16 * pNumSubs,
             TRDP_SUBS_STATISTICS_T * pStatistics )
```

Return PD subscription statistics.

Memory for statistics information must be provided by the user.

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in,out	*pNumSubs*	In: The number of subscriptions requested Out: Number of subscriptions returned
in,out	*pStatistics*	Pointer to an array with the subscription statistics information

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid
TRDP_PARAM_ERR	parameter error
TRDP_MEM_ERR	there are more subscriptions than requested

5.23.2.12 tlc_getVersion()

```
EXT_DECL const TRDP_VERSION_T* tlc_getVersion (
             void )
```

Return version.

Return pointer to version structure

Return values

TRDP_VERSION←_T	

5.23.2.13 tlc_getVersionString()

```
EXT_DECL const CHAR8* tlc_getVersionString (
            void  )
```

Return a human readable version representation.

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

Return values

const	string

5.23.2.14 tlc_init()

```
EXT_DECL TRDP_ERR_T tlc_init (
            const TRDP_PRINT_DBG_T pPrintDebugString,
            void * pRefCon,
            const TRDP_MEM_CONFIG_T * pMemConfig )
```

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

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

tlc_init initializes the memory subsystem and takes a function pointer to an output function for logging.

Parameters

in	*pPrintDebugString*	Pointer to debug print function
in	*pRefCon*	user context
in	*pMemConfig*	Pointer to memory configuration

Return values

TRDP_NO_ERR	no error
TRDP_MEM_ERR	memory allocation failed
TRDP_PARAM_ERR	initialization error

5.23.2.15 tlc_openSession()

```
EXT_DECL TRDP_ERR_T tlc_openSession (
            TRDP_APP_SESSION_T * pAppHandle,
            TRDP_IP_ADDR_T ownIpAddr,
            TRDP_IP_ADDR_T leaderIpAddr,
            const TRDP_MARSHALL_CONFIG_T * pMarshall,
            const TRDP_PD_CONFIG_T * pPdDefault,
            const TRDP_MD_CONFIG_T * pMdDefault,
            const TRDP_PROCESS_CONFIG_T * pProcessConfig )
```

Open a session with the TRDP stack.

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

Parameters

out	*pAppHandle*	A handle for further calls to the trdp stack
in	*ownIpAddr*	Own IP address, can be different for each process in multihoming systems, if zero, the default interface / IP will be used.
in	*leaderIpAddr*	IP address of redundancy leader
in	*pMarshall*	Pointer to marshalling configuration
in	*pPdDefault*	Pointer to default PD configuration
in	*pMdDefault*	Pointer to default MD configuration
in	*pProcessConfig*	Pointer to process configuration only option parameter is used here to define session behavior all other parameters are only used to feed statistics

Return values

TRDP_NO_ERR	no error
TRDP_INIT_ERR	not yet inited
TRDP_PARAM_ERR	parameter error
TRDP_SOCK_ERR	socket error

5.23.2.16 tlc_process()

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

Note: If using tlc_process(), do not use tlp_process∗() and tlm_process() calls at the same time! Single thread usage -> use tlc_getInterval(), vos_select(), tlc_process() Multiple threads -> thread 1: use tlp_getInterval(), vos_select(), tlp_processReceive() -> thread 2: cyclically call tlp_processSend() -> thread 3: use tlm_getInterval(), vos_select(), tlm_process() for message data

Also see User Manual.

Parameters

in	*appHandle*	The handle returned by tlc_openSession
in	*pRfds*	pointer to set of ready descriptors
in,out	*pCount*	pointer to number of ready descriptors

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid

5.23.2.17 tlc_reinitSession()

```
EXT_DECL TRDP_ERR_T tlc_reinitSession (
            TRDP_APP_SESSION_T appHandle )
```

Re-Initialize.

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

Parameters

in	*appHandle*	The handle returned by tlc_openSession

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid
TRDP_PARAM_ERR	handle NULL

5.23.2.18 tlc_resetStatistics()

```
EXT_DECL TRDP_ERR_T tlc_resetStatistics (
            TRDP_APP_SESSION_T appHandle )
```

Reset statistics.

Parameters

in	*appHandle*	the handle returned by tlc_openSession

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid
TRDP_PARAM_ERR	parameter error

5.23.2.19 tlc_setETBTopoCount()

```
EXT_DECL TRDP_ERR_T tlc_setETBTopoCount (
            TRDP_APP_SESSION_T appHandle,
            UINT32 etbTopoCnt )
```

Set new topocount for trainwide communication.

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

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*etbTopoCnt*	New etbTopoCnt value

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid

5.23.2.20 tlc_setOpTrainTopoCount()

```
EXT_DECL TRDP_ERR_T tlc_setOpTrainTopoCount (
            TRDP_APP_SESSION_T appHandle,
            UINT32 opTrnTopoCnt )
```

Set new operational train topocount for direction/orientation sensitive communication.

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

Parameters

in	*appHandle*	The handle returned by tlc_openSession
in	*opTrnTopoCnt*	New operational topocount value

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid

5.23.2.21 tlc_terminate()

```
EXT_DECL TRDP_ERR_T tlc_terminate (
            void )
```

Un-Initialize.

Clean up and close all sessions. Mainly used for debugging/test runs. No further calls to library allowed

Return values

TRDP_NO_ERR	no error
TRDP_INIT_ERR	no error
TRDP_MEM_ERR	TrafficStore nothing
TRDP_MUTEX_ERR	TrafficStore mutex err

5.23.2.22 tlc_updateSession()

```
EXT_DECL TRDP_ERR_T tlc_updateSession (
            TRDP_APP_SESSION_T appHandle )
```

Update a session.

tlc_updateSession signals the end of the set-up phase to the stack. It shall be called after the last publisher and subscriber was added and will create and compute the index tables to be used by the high-performance targets. This function is currently a no-op on standard targets.

Parameters

in	*appHandle*	A handle for further calls to the trdp stack

Return values

TRDP_NO_ERR	no error
TRDP_INIT_ERR	not yet inited
TRDP_PARAM_ERR	parameter error

5.23.2.23 tlm_abortSession()

```
EXT_DECL TRDP_ERR_T tlm_abortSession (
            TRDP_APP_SESSION_T appHandle,
            const TRDP_UUID_T * pSessionId )
```

Cancel an open session.

Abort an open session; any pending messages will be dropped

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*p↩ SessionId*	Session ID returned by request

Return values

TRDP_NO_ERR	no error

Return values

TRDP_NOSESSION_ERR	no such session
TRDP_NOINIT_ERR	handle invalid

5.23.2.24 tlm_addListener()

```
EXT_DECL TRDP_ERR_T tlm_addListener (
            TRDP_APP_SESSION_T appHandle,
            TRDP_LIS_T * pListenHandle,
            const void * pUserRef,
            TRDP_MD_CALLBACK_T pfCbFunction,
            BOOL8 comIdListener,
            UINT32 comId,
            UINT32 etbTopoCnt,
            UINT32 opTrnTopoCnt,
            TRDP_IP_ADDR_T srcIpAddr1,
            TRDP_IP_ADDR_T srcIpAddr2,
            TRDP_IP_ADDR_T mcDestIpAddr,
            TRDP_FLAGS_T pktFlags,
            const TRDP_URI_USER_T srcURI,
            const TRDP_URI_USER_T destURI )
```

Subscribe to MD messages.

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

Parameters

in	*appHandle*	the handle returned by tlc_openSession
out	*pListenHandle*	Handle for this listener returned
in	*pUserRef*	user supplied value returned with received message
in	*pfCbFunction*	Pointer to listener specific callback function, NULL to use default function
in	*comIdListener*	set TRUE if comId shall be observed
in	*comId*	comId to be observed
in	*etbTopoCnt*	ETB topocount to use, 0 if consist local communication
in	*opTrnTopoCnt*	operational topocount, != 0 for orientation/direction sensitive communication
in	*srcIpAddr1*	Source IP address, lower address in case of address range, set to 0 if not used
in	*srcIpAddr2*	upper address in case of address range, set to 0 if not used
in	*mcDestIpAddr*	multicast group to listen on
in	*pktFlags*	OPTION: TRDP_FLAGS_DEFAULT, TRDP_FLAGS_MARSHALL
in	*srcURI*	only functional group of source URI, set to NULL if not used
in	*destURI*	only functional group of destination URI, set to NULL if not used

Return values

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

5.23.2.25 tlm_confirm()

```
EXT_DECL TRDP_ERR_T tlm_confirm (
             TRDP_APP_SESSION_T appHandle,
             const TRDP_UUID_T * pSessionId,
             UINT16 userStatus,
             const TRDP_SEND_PARAM_T * pSendParam )
```

Initiate sending MD confirm message.

Send a MD confirmation message User reference, source and destination IP addresses as well as topo counts and packet flags are taken from the session

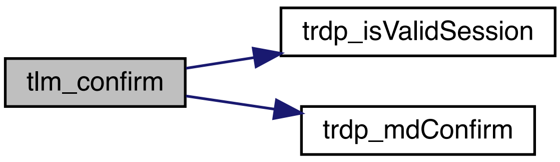
Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*pSessionId*	Session ID returned by request
in	*userStatus*	Info for requester about application errors
in	*pSendParam*	Pointer to send parameters, NULL to use default send parameters

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	parameter error
TRDP_MEM_ERR	out of memory
TRDP_NOSESSION_ERR	no such session
TRDP_NOINIT_ERR	handle invalid

Here is the call graph for this function:



5.23.2.26 tlm_delListener()

```
EXT_DECL TRDP_ERR_T tlm_delListener (
             TRDP_APP_SESSION_T appHandle,
             TRDP_LIS_T listenHandle )
```

Remove Listener.

Parameters

in	*appHandle*	the handle returned by tlc_openSession
out	*listenHandle*	Handle for this listener

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	parameter error
TRDP_NOINIT_ERR	handle invalid

5.23.2.27 tlm_getInterval()

```
EXT_DECL TRDP_ERR_T tlm_getInterval (
             TRDP_APP_SESSION_T appHandle,
             TRDP_TIME_T * pInterval,
             TRDP_FDS_T * pFileDesc,
             INT32 * pNoDesc )
```

Get the lowest time interval for MDs.

Return the maximum time interval suitable for 'select()' so that we can report time outs to the higher layer.

Parameters

in	*appHandle*	The handle returned by tlc_openSession
out	*pInterval*	pointer to needed interval
in,out	*pFileDesc*	pointer to file descriptor set
out	*pNoDesc*	pointer to put no of highest used descriptors (for select())

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid

5.23.2.28 tlm_notify()

```
EXT_DECL TRDP_ERR_T tlm_notify (
             TRDP_APP_SESSION_T appHandle,
             const void * pUserRef,
             TRDP_MD_CALLBACK_T pfCbFunction,
             UINT32 comId,
             UINT32 etbTopoCnt,
             UINT32 opTrnTopoCnt,
             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

in	*appHandle*	the handle returned by tlc_openSession
in	*pUserRef*	user supplied value returned with reply
in	*pfCbFunction*	Pointer to listener specific callback function, NULL to use default function
in	*comId*	comId of packet to be sent
in	*etbTopoCnt*	ETB topocount to use, 0 if consist local communication
in	*opTrnTopoCnt*	operational topocount, != 0 for orientation/direction sensitive communication
in	*srcIpAddr*	own IP address, 0 - srcIP will be set by the stack
in	*destIpAddr*	where to send the packet to
in	*pktFlags*	OPTION: TRDP_FLAGS_DEFAULT, TRDP_FLAGS_NONE, TRDP_FLAGS_MARSHALL, TRDP_FLAGS_CALLBACK
in	*pSendParam*	optional pointer to send parameter, NULL - default parameters are used
in	*pData*	pointer to packet data / dataset
in	*dataSize*	size of packet data
in	*sourceURI*	only functional group of source URI
in	*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

5.23.2.29 tlm_process()

```
EXT_DECL TRDP_ERR_T tlm_process (
            TRDP_APP_SESSION_T appHandle,
            TRDP_FDS_T * pRfds,
            INT32 * pCount )
```

Message Data Work loop of the TRDP handler.

Search the queue for pending MDs to be sent Search the receive queue for pending MDs (replies, time outs) and incoming requests

Parameters

in	*appHandle*	The handle returned by tlc_openSession
in	*pRfds*	pointer to set of ready descriptors
in,out	*pCount*	pointer to number of ready descriptors

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid

5.23.2.30 tlm_readdListener()

```
EXT_DECL TRDP_ERR_T tlm_readdListener (
            TRDP_APP_SESSION_T appHandle,
            TRDP_LIS_T listenHandle,
            UINT32 etbTopoCnt,
            UINT32 opTrnTopoCnt,
            TRDP_IP_ADDR_T srcIpAddr1,
            TRDP_IP_ADDR_T srcIpAddr2,
            TRDP_IP_ADDR_T mcDestIpAddr )
```

Resubscribe to MD messages.

Readd a listener after topoCount changes to get notified when messages are received

Parameters

in	*appHandle*	the handle returned by tlc_openSession
out	*listenHandle*	Handle for this listener
in	*etbTopoCnt*	ETB topocount to use, 0 if consist local communication
in	*opTrnTopoCnt*	operational topocount, != 0 for orientation/direction sensitive communication
in	*srcIpAddr1*	Source IP address, lower address in case of address range, set to 0 if not used
in	*srcIpAddr2*	upper address in case of address range, set to 0 if not used
in	*mcDestIpAddr*	multicast group to listen on

Return values

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

5.23.2.31 tlm_reply()

```
TRDP_ERR_T tlm_reply (
            TRDP_APP_SESSION_T appHandle,
            const TRDP_UUID_T * pSessionId,
            UINT32 comId,
            UINT16 userStatus,
            const TRDP_SEND_PARAM_T * pSendParam,
            const UINT8 * pData,
            UINT32 dataSize )
```

Send a MD reply message.

Send a MD reply message after receiving an request User reference, source and destination IP addresses as well as topo counts and packet flags are taken from the session

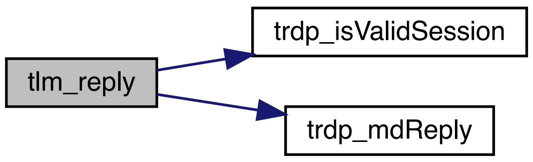
Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*pSessionId*	Session ID returned by indication
in	*comId*	comId of packet to be sent
in	*userStatus*	Info for requester about application errors
in	*pSendParam*	Pointer to send parameters, NULL to use default send parameters
in	*pData*	pointer to packet data / dataset
in	*dataSize*	size of packet data

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

Here is the call graph for this function:



5.23.2.32 tlm_replyQuery()

```
TRDP_ERR_T tlm_replyQuery (
            TRDP_APP_SESSION_T appHandle,
            const TRDP_UUID_T * pSessionId,
            UINT32 comId,
            UINT16 userStatus,
            UINT32 confirmTimeout,
            const TRDP_SEND_PARAM_T * pSendParam,
            const UINT8 * pData,
            UINT32 dataSize )
```

Send a MD reply query message.

Send a MD reply query message after receiving a request and ask for confirmation. User reference, source and destination IP addresses as well as topo counts and packet flags are taken from the session

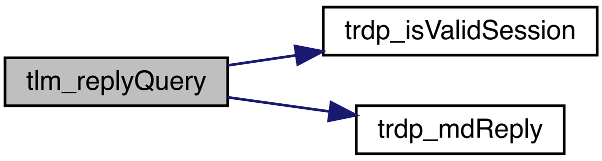
Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*pSessionId*	Session ID returned by indication
in	*comId*	comId of packet to be sent
in	*userStatus*	Info for requester about application errors
in	*confirmTimeout*	timeout for confirmation
in	*pSendParam*	Pointer to send parameters, NULL to use default send parameters
in	*pData*	pointer to packet data / dataset
in	*dataSize*	size of packet data

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

Here is the call graph for this function:



5.23.2.33 tlm_request()

```
EXT_DECL TRDP_ERR_T tlm_request (
            TRDP_APP_SESSION_T appHandle,
            const void * pUserRef,
            TRDP_MD_CALLBACK_T pfCbFunction,
            TRDP_UUID_T * pSessionId,
            UINT32 comId,
            UINT32 etbTopoCnt,
            UINT32 opTrnTopoCnt,
            TRDP_IP_ADDR_T srcIpAddr,
            TRDP_IP_ADDR_T destIpAddr,
            TRDP_FLAGS_T pktFlags,
            UINT32 numReplies,
            UINT32 replyTimeout,
            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 request message.

Send a MD request message

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*pUserRef*	user supplied value returned with reply
in	*pfCbFunction*	Pointer to listener specific callback function, NULL to use default function
out	*pSessionId*	return session ID
in	*comId*	comId of packet to be sent
in	*etbTopoCnt*	ETB topocount to use, 0 if consist local communication
in	*opTrnTopoCnt*	operational topocount, != 0 for orientation/direction sensitive communication
in	*srcIpAddr*	own IP address, 0 - srcIP will be set by the stack
in	*destIpAddr*	where to send the packet to
in	*pktFlags*	OPTION: TRDP_FLAGS_DEFAULT, TRDP_FLAGS_NONE, TRDP_FLAGS_MARSHALL
in	*numReplies*	number of expected replies, 0 if unknown
in	*replyTimeout*	timeout for reply
in	*pSendParam*	Pointer to send parameters, NULL to use default send parameters
in	*pData*	pointer to packet data / dataset
in	*dataSize*	size of packet data
in	*sourceURI*	only functional group of source URI
in	*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

5.23.2.34 tlp_get()

```
EXT_DECL TRDP_ERR_T tlp_get (
            TRDP_APP_SESSION_T appHandle,
            TRDP_SUB_T subHandle,
            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

in	*appHandle*	the handle returned by tlc_openSession
in	*subHandle*	the handle returned by subscription
in,out	*pPdInfo*	pointer to application's info buffer
in,out	*pData*	pointer to application's data buffer
in,out	*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
TRDP_COMID_ERR	ComID not found when marshalling

5.23.2.35 tlp_getInterval()

```
EXT_DECL TRDP_ERR_T tlp_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

in	*appHandle*	The handle returned by tlc_openSession
out	*pInterval*	pointer to needed interval
in,out	*pFileDesc*	pointer to file descriptor set
out	*pNoDesc*	pointer to put no of highest used descriptors (for select())

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid

5.23.2.36 tlp_getRedundant()

```
EXT_DECL TRDP_ERR_T tlp_getRedundant (
             TRDP_APP_SESSION_T appHandle,
             UINT32 redId,
             BOOL8 * pLeader )
```

Get status of redundant ComIds.

Only the status of the first found redundancy group entry will be returned!

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*redId*	will be returned for all ComID's with the given redId
in,out	*pLeader*	TRUE if we're sending this redundancy group (leader)

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	redId invalid or not existing
TRDP_NOINIT_ERR	handle invalid

5.23.2.37 tlp_processReceive()

```
EXT_DECL TRDP_ERR_T tlp_processReceive (
             TRDP_APP_SESSION_T appHandle,
             TRDP_FDS_T * pRfds,
             INT32 * pCount )
```

Work loop of the TRDP handler.

Check the sockets for incoming PD telegrams. Search the receive queue for pending PDs (time out) and report them, either by informing the higher layer via the callback mechanism or just by marking the subscriber as timed-out

Parameters

in	*appHandle*	The handle returned by tlc_openSession
in	*pRfds*	pointer to set of ready descriptors
in,out	*pCount*	pointer to number of ready descriptors

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid

5.23.2.38 tlp_processSend()

```
EXT_DECL TRDP_ERR_T tlp_processSend (
            TRDP_APP_SESSION_T appHandle )
```

Work loop of the TRDP handler.

Search the queue for pending PDs to be sent

Parameters

in	*appHandle*	The handle returned by tlc_openSession

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid

5.23.2.39 tlp_publish()

```
EXT_DECL TRDP_ERR_T tlp_publish (
            TRDP_APP_SESSION_T appHandle,
            TRDP_PUB_T * pPubHandle,
            const void * pUserRef,
            TRDP_PD_CALLBACK_T pfCbFunction,
            UINT32 serviceId,
            UINT32 comId,
            UINT32 etbTopoCnt,
            UINT32 opTrnTopoCnt,
            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 )
```

Prepare for sending PD messages.

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

Parameters

`in`	*appHandle*	the handle returned by tlc_openSession
`out`	*pPubHandle*	returned handle for related re/unpublish
`in`	*pUserRef*	user supplied value returned within the info structure of callback function
`in`	*pfCbFunction*	Pointer to pre-send callback function, NULL if not used
`in`	*serviceId*	optional serviceId this telegram belongs to (default = 0)
`in`	*comId*	comId of packet to send
`in`	*etbTopoCnt*	ETB topocount to use, 0 if consist local communication
`in`	*opTrnTopoCnt*	operational topocount, != 0 for orientation/direction sensitive communication
`in`	*srcIpAddr*	own IP address, 0 - srcIP will be set by the stack
`in`	*destIpAddr*	where to send the packet to
`in`	*interval*	frequency of PD packet (>= 10ms) in usec
`in`	*redId*	0 - Non-redundant, > 0 valid redundancy group
`in`	*pktFlags*	OPTION: TRDP_FLAGS_DEFAULT, TRDP_FLAGS_NONE, TRDP_FLAGS_MARSHALL, TRDP_FLAGS_CALLBACK
`in`	*pSendParam*	optional pointer to send parameter, NULL - default parameters are used
`in`	*pData*	optional pointer to data packet / dataset, NULL if sending starts later with tlp_put()
`in`	*dataSize*	size of data packet >= 0 and <= TRDP_MAX_PD_DATA_SIZE

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

5.23.2.40 tlp_put()

```
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.

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

Parameters

`in`	*appHandle*	the handle returned by tlc_openSession
`in`	*pubHandle*	the handle returned by publish
`in,out`	*pData*	pointer to application's data buffer
`in,out`	*dataSize*	size of data

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	parameter error on uninitialized parameter or changed dataSize compared to published one
TRDP_NOPUB_ERR	not published
TRDP_NOINIT_ERR	handle invalid
TRDP_COMID_ERR	ComID not found when marshalling

5.23.2.41 tlp_putImmediate()

```
EXT_DECL TRDP_ERR_T tlp_putImmediate (
            TRDP_APP_SESSION_T appHandle,
            TRDP_PUB_T pubHandle,
            const UINT8 * pData,
            UINT32 dataSize,
            VOS_TIMEVAL_T * pTxTime )
```

Update and send process data.

Update previously published data. The new telegram will be sent immediatly or at txTime, if txTime != 0 and TSN == 1 Should be used if application (or higher layer, e.g. ara::com and acyclic events) needs full control over process data schedule.

Note: For TSN this function is not protected by any mutexes and should not be called while adding or removing any publishers, subscribers or even sessions! Also: Marshalling is not supported!

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*pubHandle*	the handle returned by publish
in,out	*pData*	pointer to application's data buffer
in,out	*dataSize*	size of data
in	*pTxTime*	when to send (absolute time), optional for TSN only

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	parameter error on uninitialized parameter or changed dataSize compared to published one
TRDP_NOPUB_ERR	not published
TRDP_NOINIT_ERR	handle invalid

5.23.2.42 tlp_republish()

```
EXT_DECL TRDP_ERR_T tlp_republish (
            TRDP_APP_SESSION_T appHandle,
            TRDP_PUB_T pubHandle,
            UINT32 etbTopoCnt,
            UINT32 opTrnTopoCnt,
            TRDP_IP_ADDR_T srcIpAddr,
            TRDP_IP_ADDR_T destIpAddr )
```

Prepare for sending PD messages.

Reinitialize and queue a PD message, it will be send when tlc_publish has been called

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*pubHandle*	handle for related unpublish
in	*etbTopoCnt*	ETB topocount to use, 0 if consist local communication
in	*opTrnTopoCnt*	operational topocount, != 0 for orientation/direction sensitive communication
in	*srcIpAddr*	own IP address, 0 - srcIP will be set by the stack
in	*destIpAddr*	where to send the packet to

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

5.23.2.43 tlp_request()

```
EXT_DECL TRDP_ERR_T tlp_request (
            TRDP_APP_SESSION_T appHandle,
            TRDP_SUB_T subHandle,
            UINT32 serviceId,
            UINT32 comId,
            UINT32 etbTopoCnt,
            UINT32 opTrnTopoCnt,
            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 )
```

Initiate sending PD messages (PULL).

Send a PD request message

Parameters

in	*appHandle*	the handle returned by tlc_openSession

Parameters

in	*subHandle*	handle from related subscribe
in	*serviceId*	optional serviceId this telegram belongs to (default = 0)
in	*comId*	comId of packet to be sent
in	*etbTopoCnt*	ETB topocount to use, 0 if consist local communication
in	*opTrnTopoCnt*	operational topocount, != 0 for orientation/direction sensitive communication
in	*srcIpAddr*	own IP address, 0 - srcIP will be set by the stack
in	*destIpAddr*	where to send the packet to
in	*redId*	0 - Non-redundant, > 0 valid redundancy group
in	*pktFlags*	OPTION: TRDP_FLAGS_DEFAULT, TRDP_FLAGS_NONE, TRDP_FLAGS_MARSHALL, TRDP_FLAGS_CALLBACK
in	*pSendParam*	optional pointer to send parameter, NULL - default parameters are used
in	*pData*	pointer to packet data / dataset
in	*dataSize*	size of packet data
in	*replyComId*	comId of reply (default comID of subscription)
in	*replyIpAddr*	IP for reply

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_NOSUB_ERR	no matching subscription found

5.23.2.44 tlp_resubscribe()

```
EXT_DECL TRDP_ERR_T tlp_resubscribe (
            TRDP_APP_SESSION_T appHandle,
            TRDP_SUB_T subHandle,
            UINT32 etbTopoCnt,
            UINT32 opTrnTopoCnt,
            TRDP_IP_ADDR_T srcIpAddr1,
            TRDP_IP_ADDR_T srcIpAddr2,
            TRDP_IP_ADDR_T destIpAddr )
```

Reprepare for receiving PD messages.

Resubscribe to a specific PD ComID and source IP

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*subHandle*	handle for this subscription
in	*etbTopoCnt*	ETB topocount to use, 0 if consist local communication
in	*opTrnTopoCnt*	operational topocount, != 0 for orientation/direction sensitive communication
in	*srcIpAddr1*	Source IP address, lower address in case of address range, set to 0 if not used
in	*srcIpAddr2*	upper address in case of address range, set to 0 if not used
in	*destIpAddr*	IP address to join

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
TRDP_SOCK_ERR	Resource (socket) not available, subscription canceled

5.23.2.45 tlp_setRedundant()

```
EXT_DECL TRDP_ERR_T tlp_setRedundant (
            TRDP_APP_SESSION_T appHandle,
            UINT32 redId,
            BOOL8 leader )
```

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

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*redId*	will be set for all ComID's with the given redId, 0 to change for all redId
in	*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

5.23.2.46 tlp_subscribe()

```
EXT_DECL TRDP_ERR_T tlp_subscribe (
            TRDP_APP_SESSION_T appHandle,
            TRDP_SUB_T * pSubHandle,
            const void * pUserRef,
            TRDP_PD_CALLBACK_T pfCbFunction,
            UINT32 serviceId,
            UINT32 comId,
            UINT32 etbTopoCnt,
            UINT32 opTrnTopoCnt,
            TRDP_IP_ADDR_T srcIpAddr1,
            TRDP_IP_ADDR_T srcIpAddr2,
            TRDP_IP_ADDR_T destIpAddr,
            TRDP_FLAGS_T pktFlags,
            const TRDP_COM_PARAM_T * pRecParams,
            UINT32 timeout,
            TRDP_TO_BEHAVIOR_T toBehavior )
```

Prepare for receiving PD messages.

Subscribe to a specific PD ComID and source IP.

Parameters

in	*appHandle*	the handle returned by tlc_openSession
out	*pSubHandle*	return a handle for this subscription
in	*pUserRef*	user supplied value returned within the info structure
in	*pfCbFunction*	Pointer to subscriber specific callback function, NULL to use default function
in	*serviceId*	optional serviceId this telegram belongs to (default = 0)
in	*comId*	comId of packet to receive
in	*etbTopoCnt*	ETB topocount to use, 0 if consist local communication
in	*opTrnTopoCnt*	operational topocount, != 0 for orientation/direction sensitive communication
in	*srcIpAddr1*	Source IP address, lower address in case of address range, set to 0 if not used
in	*srcIpAddr2*	upper address in case of address range, set to 0 if not used
in	*destIpAddr*	IP address to join
in	*pktFlags*	OPTION: TRDP_FLAGS_DEFAULT, TRDP_FLAGS_NONE, TRDP_FLAGS_MARSHALL, TRDP_FLAGS_CALLBACK
in	*pRecParams*	optional pointer to send parameter, NULL - default parameters are used
in	*timeout*	timeout (>= 10ms) in usec
in	*toBehavior*	timeout behavior

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

5.23.2.47 tlp_unpublish()

```
EXT_DECL TRDP_ERR_T tlp_unpublish (
            TRDP_APP_SESSION_T appHandle,
            TRDP_PUB_T pubHandle )
```

Stop sending PD messages.

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*pubHandle*	the handle returned by prepare

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	parameter error
TRDP_NOPUB_ERR	not published

Return values

TRDP_NOINIT_ERR	handle invalid

5.23.2.48 tlp_unsubscribe()

```
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

in	*appHandle*	the handle returned by tlc_openSession
in	*subHandle*	the handle for this subscription

Return values

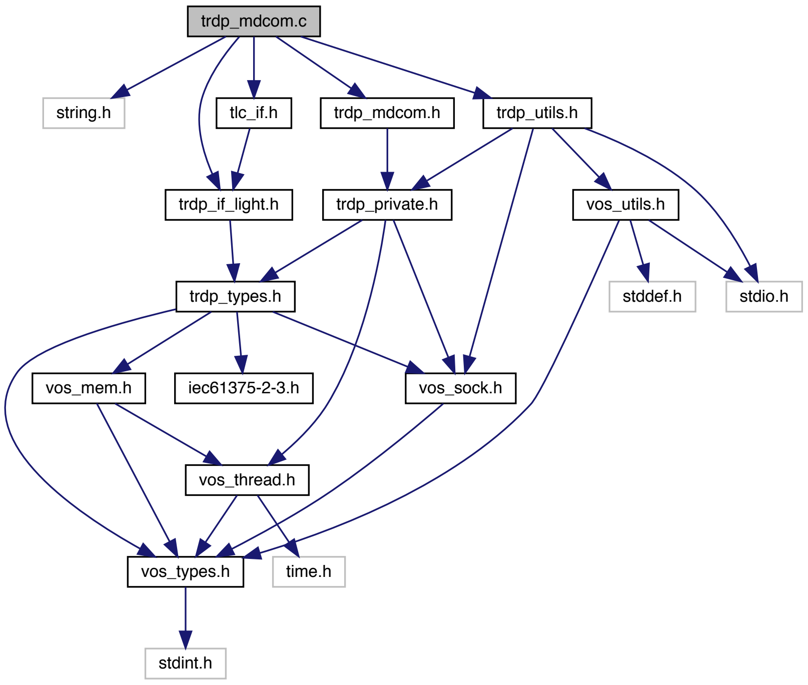
TRDP_NO_ERR	no error
TRDP_PARAM_ERR	parameter error
TRDP_NOSUB_ERR	not subscribed
TRDP_NOINIT_ERR	handle invalid

5.24 trdp_mdcom.c File Reference

Functions for MD communication.

```
#include <string.h>
#include "trdp_if_light.h"
#include "tlc_if.h"
#include "trdp_utils.h"
#include "trdp_mdcom.h"
```

Include dependency graph for trdp_mdcom.c:



Functions

- TRDP_ERR_T trdp_mdGetTCPSocket (TRDP_SESSION_PT pSession)

  Initialize the specific parameters for message data Open a listening socket.
- void trdp_mdFreeSession (MD_ELE_T ∗pMDSession)

  Free memory of session.
- TRDP_ERR_T trdp_mdSend (TRDP_SESSION_PT appHandle)

  Sending MD messages Send the messages stored in the sendQueue Call user's callback if needed.
- void trdp_mdCheckPending (TRDP_APP_SESSION_T appHandle, TRDP_FDS_T ∗pFileDesc, INT32 ∗p↩
NoDesc)

  Check for pending packets, set FD if non blocking.
- void trdp_mdCheckListenSocks (const TRDP_SESSION_PT appHandle, TRDP_FDS_T ∗pRfds, INT32 ∗p↩
Count)

  Checking receive connection requests and data Call user's callback if needed.
- void trdp_mdCheckTimeouts (TRDP_SESSION_PT appHandle)

  Checking message data timeouts Call user's callback if needed.
- TRDP_ERR_T trdp_mdReply (const TRDP_MSG_T msgType, TRDP_APP_SESSION_T appHandle, TRDP_UUID_T pSessionId, UINT32 comId, UINT32 timeout, INT32 replyStatus, const TRDP_SEND_PARAM_T ∗pSendParam, const UINT8 ∗pData, UINT32 dataSize)

  Send a MD reply/reply query message.
- TRDP_ERR_T trdp_mdCall (const TRDP_MSG_T msgType, TRDP_APP_SESSION_T appHandle, const void ∗pUserRef, TRDP_MD_CALLBACK_T pfCbFunction, TRDP_UUID_T ∗pSessionId, UINT32 comId, UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, TRDP_IP_ADDR_T srcIpAddr, TRDP_IP_ADDR_T destIp↩
Addr, TRDP_FLAGS_T pktFlags, UINT32 numExpReplies, UINT32 replyTimeout, INT32 replyStatus, const TRDP_SEND_PARAM_T ∗pSendParam, const UINT8 ∗pData, UINT32 dataSize, const TRDP_URI_USE↩
R_T srcURI, const TRDP_URI_USER_T destURI)

Initiate sending MD request message - private SW level Send a MD request message.

- TRDP_ERR_T trdp_mdConfirm (TRDP_APP_SESSION_T appHandle, const TRDP_UUID_T ∗pSessionId, UINT16 userStatus, const TRDP_SEND_PARAM_T ∗pSendParam)

  Initiate sending MD confirm message - private SW level Send a MD confirmation message User reference, source and destination IP addresses as well as topo counts and packet flags are taken from the session.

5.24.1 Detailed Description

Functions for MD communication.

Note

Project: TCNOpen TRDP prototype stack

Author

Simone Pachera, FARsystems Gari Oiarbide, CAF Michael Koch, Bombardier Transportations Bernd Loehr, NewTec

Remarks

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5.24.2 Function Documentation

5.24.2.1 trdp_mdCall()

```
TRDP_ERR_T trdp_mdCall (
             const TRDP_MSG_T msgType,
             TRDP_APP_SESSION_T appHandle,
             const void * pUserRef,
             TRDP_MD_CALLBACK_T pfCbFunction,
             TRDP_UUID_T * pSessionId,
             UINT32 comId,
             UINT32 etbTopoCnt,
             UINT32 opTrnTopoCnt,
             TRDP_IP_ADDR_T srcIpAddr,
             TRDP_IP_ADDR_T destIpAddr,
             TRDP_FLAGS_T pktFlags,
             UINT32 numExpReplies,
             UINT32 replyTimeout,
             INT32 replyStatus,
             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 - private SW level Send a MD request message.

Parameters

in	*msgType*	TRDP_MSG_MN or TRDP_MSG_MR
in	*appHandle*	the handle returned by tlc_init
in	*pUserRef*	user supplied value returned with reply
in	*pfCbFunction*	Pointer to listener specific callback function, NULL to use default function
out	*pSessionId*	return session ID
in	*comId*	comId of packet to be sent
in	*etbTopoCnt*	ETB topocount to use, 0 if consist local communication
in	*opTrnTopoCnt*	operational topocount, != 0 for orientation/direction sensitive communication
in	*srcIpAddr*	own IP address, 0 - srcIP will be set by the stack
in	*destIpAddr*	where to send the packet to
in	*pktFlags*	OPTION: TRDP_FLAGS_DEFAULT, TRDP_FLAGS_NONE, TRDP_FLAGS_MARSHALL
in	*numExpReplies*	number of expected replies, 0 if unknown
in	*replyTimeout*	timeout for reply
in	*replyStatus*	status to be returned
in	*pSendParam*	Pointer to send parameters, NULL to use default send parameters
in	*pData*	pointer to packet data / dataset
in	*dataSize*	size of packet data
in	*srcURI*	only functional group of source URI
in	*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

5.24.2.2 trdp_mdCheckListenSocks()

```
void trdp_mdCheckListenSocks (
            const TRDP_SESSION_PT appHandle,
            TRDP_FDS_T * pRfds,
            INT32 * pCount )
```

Checking receive connection requests and data Call user's callback if needed.

Parameters

in	*appHandle*	session pointer
in	*pRfds*	pointer to set of ready descriptors
in,out	*pCount*	pointer to number of ready descriptors

5.24.2.3 trdp_mdCheckPending()

```
void trdp_mdCheckPending (
             TRDP_APP_SESSION_T appHandle,
             TRDP_FDS_T * pFileDesc,
             INT32 * pNoDesc )
```

Check for pending packets, set FD if non blocking.

Parameters

in	*appHandle*	session pointer
in,out	*pFileDesc*	pointer to set of ready descriptors
in,out	*pNoDesc*	pointer to number of ready descriptors

5.24.2.4 trdp_mdCheckTimeouts()

```
void trdp_mdCheckTimeouts (
             TRDP_SESSION_PT appHandle )
```

Checking message data timeouts Call user's callback if needed.

Parameters

in	*appHandle*	session pointer

5.24.2.5 trdp_mdConfirm()

```
TRDP_ERR_T trdp_mdConfirm (
             TRDP_APP_SESSION_T appHandle,
             const TRDP_UUID_T * pSessionId,
             UINT16 userStatus,
             const TRDP_SEND_PARAM_T * pSendParam )
```

Initiate sending MD confirm message - private SW level Send a MD confirmation message User reference, source and destination IP addresses as well as topo counts and packet flags are taken from the session.

Parameters

in	*appHandle*	the handle returned by tlc_init
in	*pSessionId*	Session ID returned by request
in	*userStatus*	Info for requester about application errors
in	*pSendParam*	Pointer to send parameters, NULL to use default send parameters

Return values

TRDP_NO_ERR	no error

Return values

TRDP_PARAM_ERR	parameter error
TRDP_MEM_ERR	out of memory
TRDP_NOSESSION_ERR	no such session

5.24.2.6 trdp_mdFreeSession()

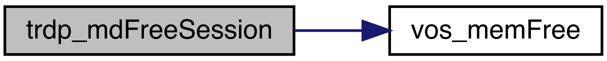
```
void trdp_mdFreeSession (
            MD_ELE_T * pMDSession )
```

Free memory of session.

Parameters

in	*pMDSession*	session pointer

Here is the call graph for this function:



5.24.2.7 trdp_mdGetTCPSocket()

```
TRDP_ERR_T trdp_mdGetTCPSocket (
            TRDP_SESSION_PT pSession )
```

Initialize the specific parameters for message data Open a listening socket.

Parameters

in	*pSession*	session parameters

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	initialization error

5.24.2.8 trdp_mdReply()

```
TRDP_ERR_T trdp_mdReply (
             const TRDP_MSG_T msgType,
             TRDP_APP_SESSION_T appHandle,
             TRDP_UUID_T pSessionId,
             UINT32 comId,
             UINT32 timeout,
             INT32 replyStatus,
             const TRDP_SEND_PARAM_T * pSendParam,
             const UINT8 * pData,
             UINT32 dataSize )
```

Send a MD reply/reply query message.

Send either a MD reply message or a MD reply query message after receiving a request and ask for confirmation. User reference, source and destination IP addresses as well as topo counts and packet flags are taken from the session

Parameters

in	*msgType*	TRDP_MSG_MP or TRDP_MSG_MQ
in	*appHandle*	the handle returned by tlc_init
in	*pSessionId*	Session ID returned by indication
in	*comId*	comId of packet to be sent
in	*timeout*	time out for confirmations (zero for TRDP_MSG_MP)
in	*replyStatus*	Info for requester about application errors
in	*pSendParam*	Pointer to send parameters, NULL to use default send parameters
in	*pData*	pointer to packet data / dataset
in	*dataSize*	size of packet data

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

5.24.2.9 trdp_mdSend()

```
TRDP_ERR_T trdp_mdSend (
             TRDP_SESSION_PT appHandle )
```

Sending MD messages Send the messages stored in the sendQueue Call user's callback if needed.

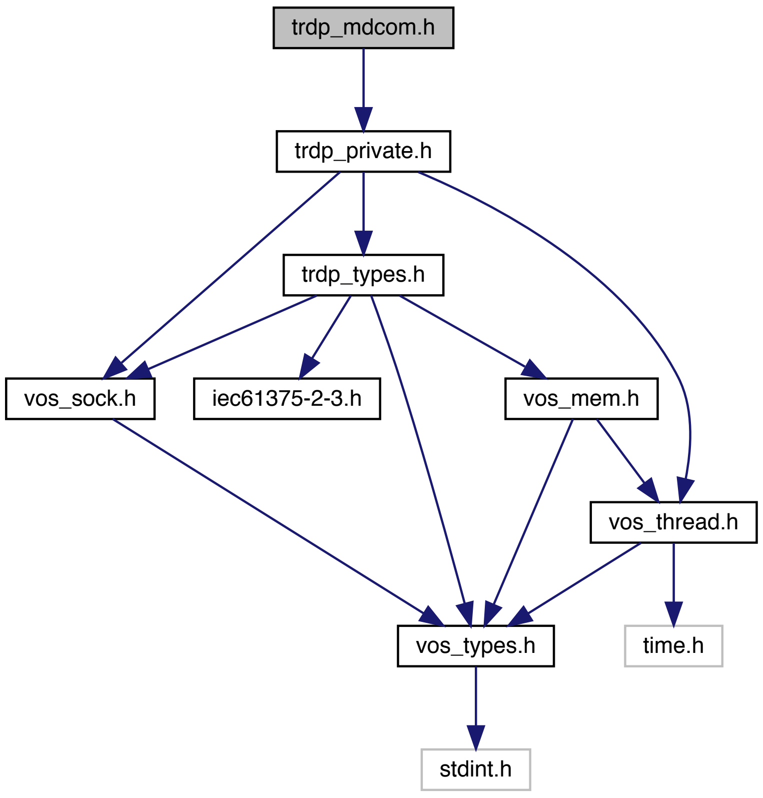
Parameters

`in`	*appHandle*	session pointer

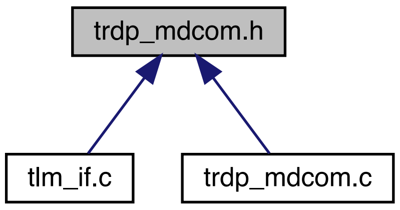
5.25 trdp_mdcom.h File Reference

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_mdGetTCPSocket (TRDP_SESSION_PT pSession)

    Initialize the specific parameters for message data Open a listening socket.
- void trdp_mdFreeSession (MD_ELE_T ∗pMDSession)

    Free memory of session.
- TRDP_ERR_T trdp_mdSend (TRDP_SESSION_PT appHandle)

    Sending MD messages Send the messages stored in the sendQueue Call user's callback if needed.
- void trdp_mdCheckPending (TRDP_APP_SESSION_T appHandle, TRDP_FDS_T ∗pFileDesc, INT32 ∗p←NoDesc)

    Check for pending packets, set FD if non blocking.
- void trdp_mdCheckListenSocks (const TRDP_SESSION_PT appHandle, TRDP_FDS_T ∗pRfds, INT32 ∗p←Count)

    Checking receive connection requests and data Call user's callback if needed.
- void trdp_mdCheckTimeouts (TRDP_SESSION_PT appHandle)

    Checking message data timeouts Call user's callback if needed.
- TRDP_ERR_T trdp_mdConfirm (TRDP_APP_SESSION_T appHandle, const TRDP_UUID_T ∗pSessionId, UINT16 userStatus, const TRDP_SEND_PARAM_T ∗pSendParam)

    Initiate sending MD confirm message - private SW level Send a MD confirmation message User reference, source and destination IP addresses as well as topo counts and packet flags are taken from the session.
- TRDP_ERR_T trdp_mdReply (const TRDP_MSG_T msgType, TRDP_APP_SESSION_T appHandle, TRDP_UUID_T pSessionId, UINT32 comId, UINT32 timeout, INT32 replyStatus, const TRDP_SEND_PARAM_T ∗pSendParam, const UINT8 ∗pData, UINT32 dataSize)

    Send a MD reply/reply query message.
- TRDP_ERR_T trdp_mdCall (const TRDP_MSG_T msgType, TRDP_APP_SESSION_T appHandle, const void ∗pUserRef, TRDP_MD_CALLBACK_T pfCbFunction, TRDP_UUID_T ∗pSessionId, UINT32 comId, UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, TRDP_IP_ADDR_T srcIpAddr, TRDP_IP_ADDR_T destIp←Addr, TRDP_FLAGS_T pktFlags, UINT32 numExpReplies, UINT32 replyTimeout, INT32 replyStatus, const TRDP_SEND_PARAM_T ∗pSendParam, const UINT8 ∗pData, UINT32 dataSize, const TRDP_URI_USE←R_T srcURI, const TRDP_URI_USER_T destURI)

    Initiate sending MD request message - private SW level Send a MD request message.

5.25.1 Detailed Description

Functions for MD communication.

Note

Project: TCNOpen TRDP prototype stack

Author

Bernd Loehr, NewTec GmbH

Remarks

5.25.2 Function Documentation

5.25.2.1 trdp_mdCall()

```
TRDP_ERR_T trdp_mdCall (
             const TRDP_MSG_T msgType,
             TRDP_APP_SESSION_T appHandle,
             const void * pUserRef,
             TRDP_MD_CALLBACK_T pfCbFunction,
             TRDP_UUID_T * pSessionId,
             UINT32 comId,
             UINT32 etbTopoCnt,
             UINT32 opTrnTopoCnt,
             TRDP_IP_ADDR_T srcIpAddr,
             TRDP_IP_ADDR_T destIpAddr,
             TRDP_FLAGS_T pktFlags,
             UINT32 numExpReplies,
             UINT32 replyTimeout,
             INT32 replyStatus,
             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 - private SW level Send a MD request message.

Parameters

in	*msgType*	TRDP_MSG_MN or TRDP_MSG_MR
in	*appHandle*	the handle returned by tlc_init
in	*pUserRef*	user supplied value returned with reply
in	*pfCbFunction*	Pointer to listener specific callback function, NULL to use default function
out	*pSessionId*	return session ID
in	*comId*	comId of packet to be sent
in	*etbTopoCnt*	ETB topocount to use, 0 if consist local communication
in	*opTrnTopoCnt*	operational topocount, != 0 for orientation/direction sensitive communication

Parameters

in	*srcIpAddr*	own IP address, 0 - srcIP will be set by the stack
in	*destIpAddr*	where to send the packet to
in	*pktFlags*	OPTION: TRDP_FLAGS_DEFAULT, TRDP_FLAGS_NONE, TRDP_FLAGS_MARSHALL
in	*numExpReplies*	number of expected replies, 0 if unknown
in	*replyTimeout*	timeout for reply
in	*replyStatus*	status to be returned
in	*pSendParam*	Pointer to send parameters, NULL to use default send parameters
in	*pData*	pointer to packet data / dataset
in	*dataSize*	size of packet data
in	*srcURI*	only functional group of source URI
in	*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

5.25.2.2 trdp_mdCheckListenSocks()

```
void trdp_mdCheckListenSocks (
             const TRDP_SESSION_PT appHandle,
             TRDP_FDS_T * pRfds,
             INT32 * pCount )
```

Checking receive connection requests and data Call user's callback if needed.

Parameters

in	*appHandle*	session pointer
in	*pRfds*	pointer to set of ready descriptors
in,out	*pCount*	pointer to number of ready descriptors

5.25.2.3 trdp_mdCheckPending()

```
void trdp_mdCheckPending (
             TRDP_APP_SESSION_T appHandle,
             TRDP_FDS_T * pFileDesc,
             INT32 * pNoDesc )
```

Check for pending packets, set FD if non blocking.

Parameters

in	*appHandle*	session pointer
in,out	*pFileDesc*	pointer to set of ready descriptors
in,out	*pNoDesc*	pointer to number of ready descriptors

5.25.2.4 trdp_mdCheckTimeouts()

```
void trdp_mdCheckTimeouts (
            TRDP_SESSION_PT appHandle )
```

Checking message data timeouts Call user's callback if needed.

Parameters

in	*appHandle*	session pointer

5.25.2.5 trdp_mdConfirm()

```
TRDP_ERR_T trdp_mdConfirm (
            TRDP_APP_SESSION_T appHandle,
            const TRDP_UUID_T * pSessionId,
            UINT16 userStatus,
            const TRDP_SEND_PARAM_T * pSendParam )
```

Initiate sending MD confirm message - private SW level Send a MD confirmation message User reference, source and destination IP addresses as well as topo counts and packet flags are taken from the session.

Parameters

in	*appHandle*	the handle returned by tlc_init
in	*pSessionId*	Session ID returned by request
in	*userStatus*	Info for requester about application errors
in	*pSendParam*	Pointer to send parameters, NULL to use default send parameters

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	parameter error
TRDP_MEM_ERR	out of memory
TRDP_NOSESSION_ERR	no such session

5.25.2.6 trdp_mdFreeSession()

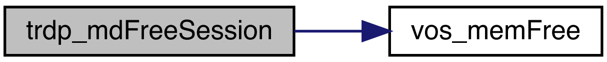
```
void trdp_mdFreeSession (
            MD_ELE_T * pMDSession )
```

Free memory of session.

Parameters

in	*pMDSession*	session pointer

Here is the call graph for this function:



5.25.2.7 trdp_mdGetTCPSocket()

```
TRDP_ERR_T trdp_mdGetTCPSocket (
            TRDP_SESSION_PT pSession )
```

Initialize the specific parameters for message data Open a listening socket.

Parameters

in	*pSession*	session parameters

Return values

TRDP_NO_ERR	no error
TRDP_PARAM_ERR	initialization error

5.25.2.8 trdp_mdReply()

```
TRDP_ERR_T trdp_mdReply (
            const TRDP_MSG_T msgType,
            TRDP_APP_SESSION_T appHandle,
            TRDP_UUID_T pSessionId,
            UINT32 comId,
            UINT32 timeout,
            INT32 replyStatus,
            const TRDP_SEND_PARAM_T * pSendParam,
            const UINT8 * pData,
            UINT32 dataSize )
```

Send a MD reply/reply query message.

Send either a MD reply message or a MD reply query message after receiving a request and ask for confirmation. User reference, source and destination IP addresses as well as topo counts and packet flags are taken from the session

Parameters

in	*msgType*	TRDP_MSG_MP or TRDP_MSG_MQ
in	*appHandle*	the handle returned by tlc_init
in	*pSessionId*	Session ID returned by indication
in	*comId*	comId of packet to be sent
in	*timeout*	time out for confirmations (zero for TRDP_MSG_MP)
in	*replyStatus*	Info for requester about application errors
in	*pSendParam*	Pointer to send parameters, NULL to use default send parameters
in	*pData*	pointer to packet data / dataset
in	*dataSize*	size of packet data

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

5.25.2.9 trdp_mdSend()

```
TRDP_ERR_T trdp_mdSend (
            TRDP_SESSION_PT appHandle )
```

Sending MD messages Send the messages stored in the sendQueue Call user's callback if needed.

Parameters

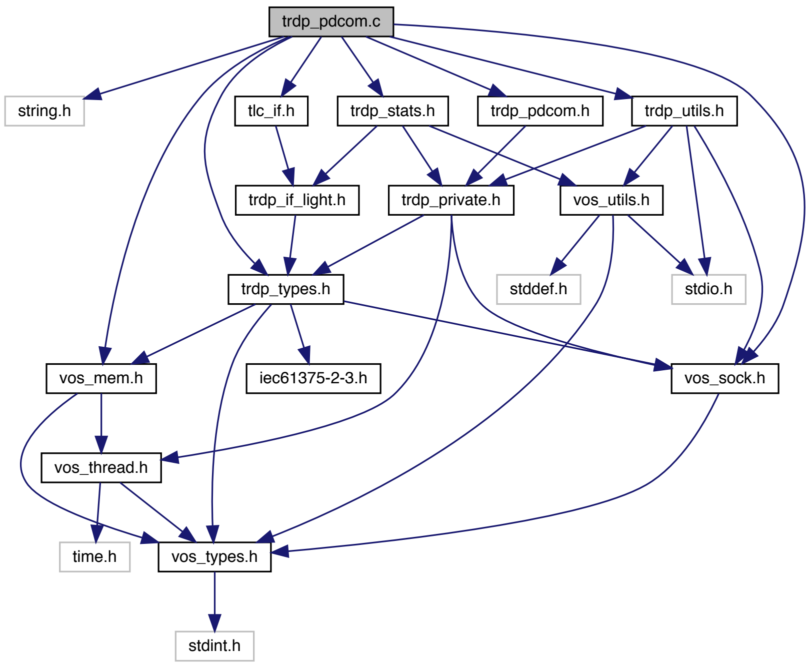
in	*appHandle*	session pointer

5.26 trdp_pdcom.c File Reference

Functions for PD communication.

```
#include <string.h>
#include "trdp_types.h"
#include "trdp_utils.h"
#include "trdp_pdcom.h"
#include "tlc_if.h"
#include "trdp_stats.h"
#include "vos_sock.h"
#include "vos_mem.h"
```

Include dependency graph for trdp_pdcom.c:



Functions

- void trdp_pdInit (PD_ELE_T ∗pPacket, TRDP_MSG_T type, UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, UINT32 replyComId, UINT32 replyIpAddress, UINT32 serviceId)

  Initialize/construct the packet Set the header infos.
- TRDP_ERR_T trdp_pdPut (PD_ELE_T ∗pPacket, TRDP_MARSHALL_T marshall, void ∗refCon, const UI↩ NT8 ∗pData, UINT32 dataSize)

  Copy data Update the data to be sent.
- TRDP_ERR_T trdp_pdSendImmediate (TRDP_SESSION_PT appHandle, PD_ELE_T ∗pSendPD)

  Send PD message immediately.
- TRDP_ERR_T trdp_pdGet (PD_ELE_T ∗pPacket, TRDP_UNMARSHALL_T unmarshall, void ∗refCon, const UINT8 ∗pData, UINT32 ∗pDataSize)

  Copy data Set the header infos.
- TRDP_ERR_T trdp_pdSendElement (TRDP_SESSION_PT appHandle, PD_ELE_T ∗∗ppElement)

  Send a due PD message.
- TRDP_ERR_T trdp_pdSendQueued (TRDP_SESSION_PT appHandle)

  Send all due PD messages.
- TRDP_ERR_T trdp_pdReceive (TRDP_SESSION_PT appHandle, SOCKET 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_pdCheckPending (TRDP_APP_SESSION_T appHandle, TRDP_FDS_T ∗pFileDesc, INT32 ∗p←NoDesc, int checkSend)

  Check for pending packets, set FD if non blocking.
- void trdp_pdHandleTimeOuts (TRDP_SESSION_PT appHandle)

  Check for time outs.
- TRDP_ERR_T trdp_pdCheckListenSocks (TRDP_SESSION_PT appHandle, TRDP_FDS_T ∗pRfds, INT32 ∗pCount)

  Checking receive connection requests and data Call user's callback if needed.
- void trdp_pdUpdate (PD_ELE_T ∗pPacket)

  Update the header values.
- TRDP_ERR_T trdp_pdCheck (PD_HEADER_T ∗pPacket, UINT32 packetSize, int ∗pIsTSN)

  Check if the PD header values and the CRCs are sane.
- TRDP_ERR_T trdp_pdSend (SOCKET pdSock, PD_ELE_T ∗pPacket, UINT16 port)

  Send one PD packet.
- TRDP_ERR_T trdp_pdDistribute (PD_ELE_T ∗pSndQueue)

  Distribute send time of PD packets over time.

5.26.1 Detailed Description

Functions for PD communication.

Note

Project: TCNOpen TRDP prototype stack

Author

Bernd Loehr, NewTec GmbH

Remarks

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5.26.2 Function Documentation

5.26.2.1 trdp_pdCheck()

```
TRDP_ERR_T trdp_pdCheck (
            PD_HEADER_T * pPacket,
            UINT32 packetSize,
            int * pIsTSN )
```

Check if the PD header values and the CRCs are sane.

Parameters

in	*pPacket*	pointer to the packet to check
in	*packetSize*	max size to check
out	*pIsTSN*	set to TRUE on return if PD2 frame

Return values

TRDP_NO_ERR	
TRDP_CRC_ERR	

5.26.2.2 trdp_pdCheckListenSocks()

```
TRDP_ERR_T trdp_pdCheckListenSocks (
             TRDP_SESSION_PT appHandle,
             TRDP_FDS_T * pRfds,
             INT32 * pCount )
```

Checking receive connection requests and data Call user's callback if needed.

Parameters

in	*appHandle*	session pointer
in	*pRfds*	pointer to set of ready descriptors
in,out	*pCount*	pointer to number of ready descriptors

5.26.2.3 trdp_pdCheckPending()

```
void trdp_pdCheckPending (
             TRDP_APP_SESSION_T appHandle,
             TRDP_FDS_T * pFileDesc,
             INT32 * pNoDesc,
             int checkSend )
```

Check for pending packets, set FD if non blocking.

Parameters

in	*appHandle*	session pointer
in,out	*pFileDesc*	pointer to set of ready descriptors
in,out	*pNoDesc*	pointer to number of ready descriptors
in	*checkSend*	check send queue, too

5.26.2.4 trdp_pdDistribute()

```
TRDP_ERR_T trdp_pdDistribute (
             PD_ELE_T * pSndQueue )
```

Distribute send time of PD packets over time.

The duration of PD packets on a 100MBit/s network ranges from 3us to 150us max. Because a cyclic thread scheduling below 5ms would put a too heavy load on the system, and PD packets cannot get larger than 1432 (+ UDP header), we will not account for differences in packet size. Another factor is the differences in intervals for different packets: We should only change the starting times of the packets within 1/2 the interval time. Otherwise a late addition of packets could lead to timeouts of already queued packets. Scheduling will be computed based on the smallest interval time.

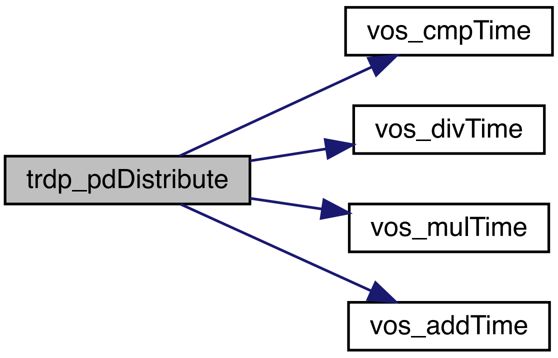
Parameters

in	*pSndQueue*	pointer to send queue

Return values

TRDP_NO_ERR	

Here is the call graph for this function:



5.26.2.5 trdp_pdHandleTimeOuts()

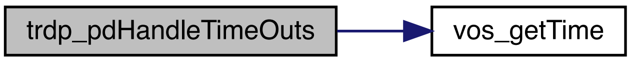
```
void trdp_pdHandleTimeOuts (
             TRDP_SESSION_PT appHandle )
```

Check for time outs.

Parameters

in	*appHandle*	application handle

Here is the call graph for this function:



5.26.2.6 trdp_pdInit()

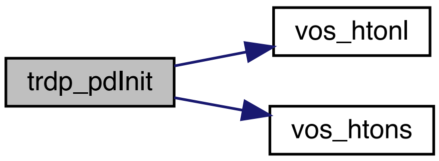
```
void trdp_pdInit (
            PD_ELE_T * pPacket,
            TRDP_MSG_T type,
            UINT32 etbTopoCnt,
            UINT32 opTrnTopoCnt,
            UINT32 replyComId,
            UINT32 replyIpAddress,
            UINT32 serviceId )
```

Initialize/construct the packet Set the header infos.

Parameters

in	*pPacket*	pointer to the packet element to init
in	*type*	type the packet
in	*etbTopoCnt*	topocount to use for PD frame
in	*opTrnTopoCnt*	topocount to use for PD frame
in	*replyComId*	Pull request comId
in	*replyIpAddress*	Pull request Ip
in	*serviceId*	Service Id

Here is the call graph for this function:



5.26.2.7 trdp_pdPut()

```
TRDP_ERR_T trdp_pdPut (
            PD_ELE_T * pPacket,
            TRDP_MARSHALL_T marshall,
            void * refCon,
            const UINT8 * pData,
            UINT32 dataSize )
```

Copy data Update the data to be sent.

Parameters

in	*pPacket*	pointer to the packet element to send
in	*marshall*	pointer to marshalling function
in	*refCon*	reference for marshalling function
in	*pData*	pointer to data
in	*dataSize*	size of data

Return values

TRDP_NO_ERR	no error other errors

5.26.2.8 trdp_pdReceive()

```
TRDP_ERR_T trdp_pdReceive (
            TRDP_SESSION_PT appHandle,
            SOCKET 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, check if it is a PD Request (PULL). If it is an update, exchange the existing entry with the new one Call user's callback if needed

Parameters

in	*appHandle*	session pointer
in	*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

5.26.2.9 trdp_pdSend()

```
TRDP_ERR_T trdp_pdSend (
             SOCKET pdSock,
             PD_ELE_T * pPacket,
             UINT16 port )
```

Send one PD packet.

Parameters

in	*pdSock*	socket descriptor
in	*pPacket*	pointer to packet to be sent
in	*port*	port on which to send

Return values

TRDP_NO_ERR	
TRDP_IO_ERR	

5.26.2.10 trdp_pdSendElement()

```
TRDP_ERR_T trdp_pdSendElement (
             TRDP_SESSION_PT appHandle,
             PD_ELE_T ** ppElement )
```

Send a due PD message.

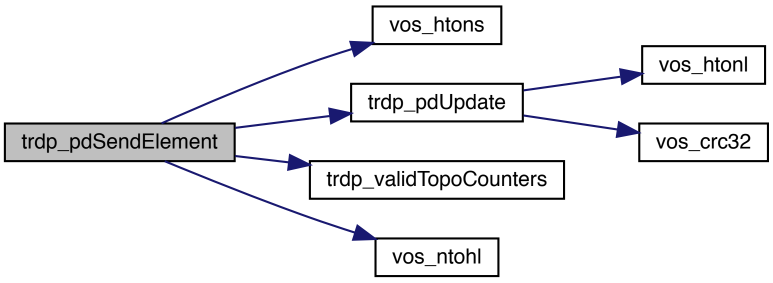
Parameters

in	*appHandle*	session pointer

Return values

TRDP_NO_ERR	no error
TRDP_IO_ERR	socket I/O error

Here is the call graph for this function:



5.26.2.11 trdp_pdSendImmediate()

```
TRDP_ERR_T trdp_pdSendImmediate (
             TRDP_SESSION_PT appHandle,
             PD_ELE_T * pSendPD )
```

Send PD message immediately.

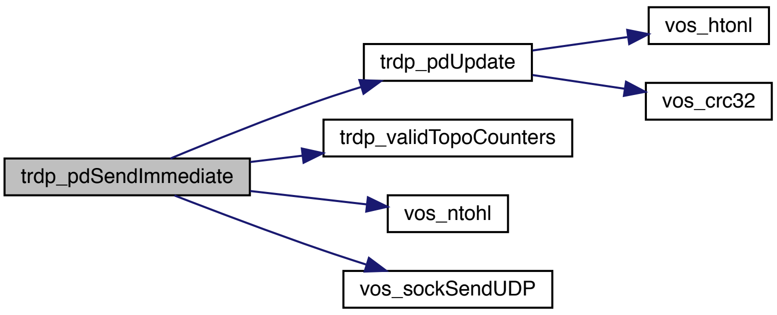
Parameters

in	*appHandle*	session pointer
in	*pSendPD*	pointer to element to be sent

Return values

TRDP_NO_ERR	no error
TRDP_IO_ERR	socket I/O error

Here is the call graph for this function:



5.26.2.12 trdp_pdSendQueued()

```
TRDP_ERR_T trdp_pdSendQueued (
            TRDP_SESSION_PT appHandle )
```

Send all due PD messages.

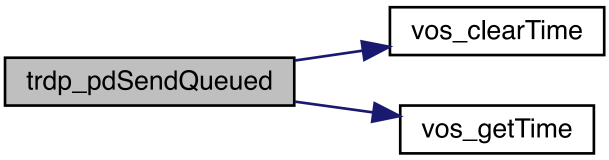
Parameters

in	*appHandle*	session pointer

Return values

TRDP_NO_ERR	no error
TRDP_IO_ERR	socket I/O error

Here is the call graph for this function:



5.26.2.13 trdp_pdUpdate()

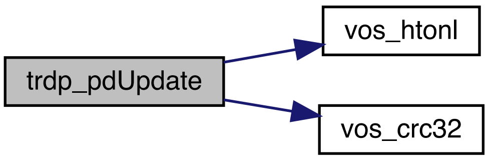
```
void trdp_pdUpdate (
            PD_ELE_T * pPacket )
```

Update the header values.

Parameters

in	*pPacket*	pointer to the packet to update

Here is the call graph for this function:

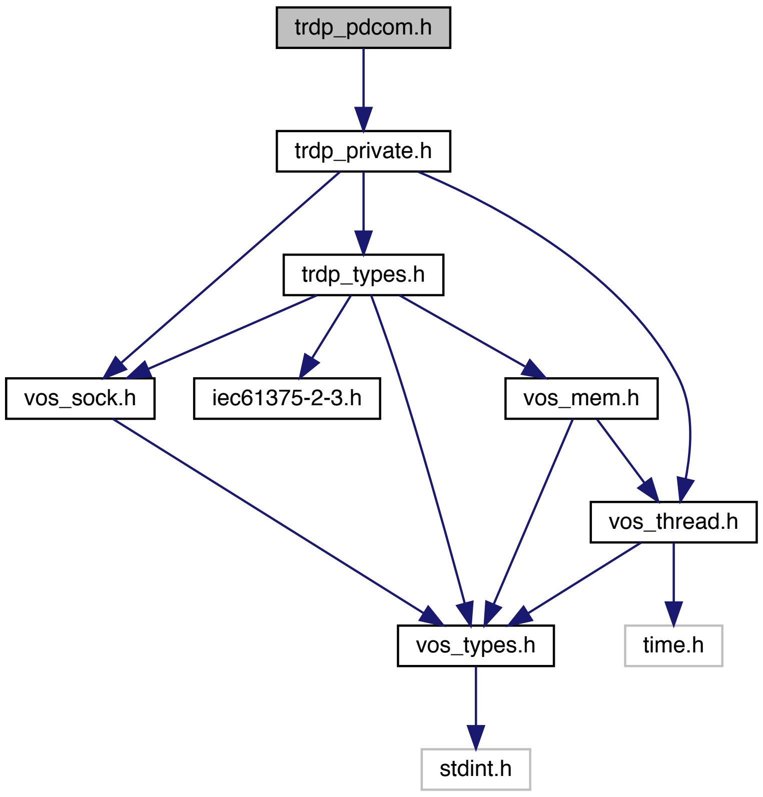


5.27 trdp_pdcom.h File Reference

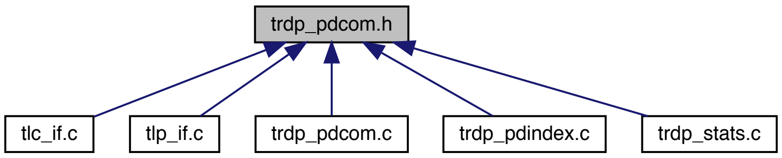
Functions for PD communication.

```
#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 topoCount, UINT32 optopoCount, UINT32 reply↩ ComId, UINT32 replyIpAddress, UINT32 serviceId)

  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 Update the data to be sent.
- TRDP_ERR_T trdp_pdCheck (PD_HEADER_T ∗pPacket, UINT32 packetSize, int ∗pIsTSN)

    Check if the PD header values and the CRCs are sane.
- TRDP_ERR_T trdp_pdSend (SOCKET pdSock, PD_ELE_T ∗pPacket, UINT16 port)

    Send one PD packet.
- TRDP_ERR_T trdp_pdGet (PD_ELE_T ∗pPacket, TRDP_UNMARSHALL_T unmarshall, void ∗refCon, const UINT8 ∗pData, UINT32 ∗pDataSize)

    Copy data Set the header infos.
- TRDP_ERR_T trdp_pdSendElement (TRDP_SESSION_PT appHandle, PD_ELE_T ∗∗ppElement)

    Send a due PD message.
- TRDP_ERR_T trdp_pdSendQueued (TRDP_SESSION_PT appHandle)

    Send all due PD messages.
- TRDP_ERR_T trdp_pdSendImmediate (TRDP_SESSION_PT appHandle, PD_ELE_T ∗pSendPD)

    Send PD message immediately.
- TRDP_ERR_T trdp_pdReceive (TRDP_SESSION_PT pSessionHandle, SOCKET 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_pdCheckPending (TRDP_APP_SESSION_T appHandle, TRDP_FDS_T ∗pFileDesc, INT32 ∗p↩ NoDesc, int checkSending)

    Check for pending packets, set FD if non blocking.
- void trdp_pdHandleTimeOuts (TRDP_SESSION_PT appHandle)

    Check for time outs.
- TRDP_ERR_T trdp_pdCheckListenSocks (TRDP_SESSION_PT appHandle, TRDP_FDS_T ∗pRfds, INT32 ∗pCount)

    Checking receive connection requests and data Call user's callback if needed.
- TRDP_ERR_T trdp_pdDistribute (PD_ELE_T ∗pSndQueue)

    Distribute send time of PD packets over time.

5.27.1 Detailed Description

Functions for PD communication.

Note

Project: TCNOpen TRDP prototype stack

Author

Bernd Loehr, NewTec GmbH

Remarks

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5.27.2 Function Documentation

5.27.2.1 trdp_pdCheck()

```
TRDP_ERR_T trdp_pdCheck (
             PD_HEADER_T * pPacket,
             UINT32 packetSize,
             int * pIsTSN )
```

Check if the PD header values and the CRCs are sane.

Parameters

in	*pPacket*	pointer to the packet to check
in	*packetSize*	max size to check
out	*pIsTSN*	set to TRUE on return if PD2 frame

Return values

TRDP_NO_ERR	
TRDP_CRC_ERR	

5.27.2.2 trdp_pdCheckListenSocks()

```
TRDP_ERR_T trdp_pdCheckListenSocks (
             TRDP_SESSION_PT appHandle,
             TRDP_FDS_T * pRfds,
             INT32 * pCount )
```

Checking receive connection requests and data Call user's callback if needed.

Parameters

in	*appHandle*	session pointer
in	*pRfds*	pointer to set of ready descriptors
in,out	*pCount*	pointer to number of ready descriptors

5.27.2.3 trdp_pdCheckPending()

```
void trdp_pdCheckPending (
             TRDP_APP_SESSION_T appHandle,
             TRDP_FDS_T * pFileDesc,
             INT32 * pNoDesc,
             int checkSend )
```

Check for pending packets, set FD if non blocking.

Parameters

in	*appHandle*	session pointer
in,out	*pFileDesc*	pointer to set of ready descriptors
in,out	*pNoDesc*	pointer to number of ready descriptors
in	*checkSend*	check send queue, too

5.27.2.4 trdp_pdDistribute()

```
TRDP_ERR_T trdp_pdDistribute (
             PD_ELE_T * pSndQueue )
```

Distribute send time of PD packets over time.

The duration of PD packets on a 100MBit/s network ranges from 3us to 150us max. Because a cyclic thread scheduling below 5ms would put a too heavy load on the system, and PD packets cannot get larger than 1432 (+ UDP header), we will not account for differences in packet size. Another factor is the differences in intervals for different packets: We should only change the starting times of the packets within 1/2 the interval time. Otherwise a late addition of packets could lead to timeouts of already queued packets. Scheduling will be computed based on the smallest interval time.

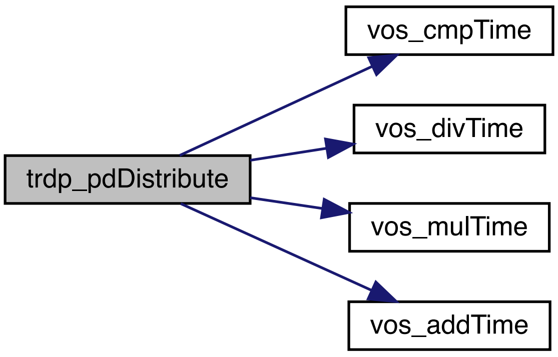
Parameters

in	*pSndQueue*	pointer to send queue

Return values

TRDP_NO_ERR	

Here is the call graph for this function:



5.27.2.5 trdp_pdHandleTimeOuts()

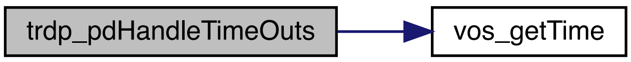
```
void trdp_pdHandleTimeOuts (
            TRDP_SESSION_PT appHandle )
```

Check for time outs.

Parameters

in	*appHandle*	application handle

Here is the call graph for this function:



5.27.2.6 trdp_pdInit()

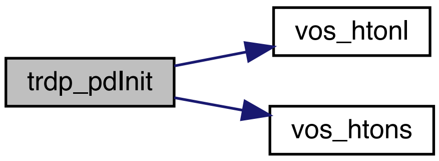
```
void trdp_pdInit (
            PD_ELE_T * pPacket,
            TRDP_MSG_T type,
            UINT32 etbTopoCnt,
            UINT32 opTrnTopoCnt,
            UINT32 replyComId,
            UINT32 replyIpAddress,
            UINT32 serviceId )
```

Initialize/construct the packet Set the header infos.

Parameters

in	*pPacket*	pointer to the packet element to init
in	*type*	type the packet
in	*etbTopoCnt*	topocount to use for PD frame
in	*opTrnTopoCnt*	topocount to use for PD frame
in	*replyComId*	Pull request comId
in	*replyIpAddress*	Pull request Ip
in	*serviceId*	Service Id

Here is the call graph for this function:



5.27.2.7 trdp_pdPut()

```
TRDP_ERR_T trdp_pdPut (
            PD_ELE_T * pPacket,
            TRDP_MARSHALL_T marshall,
            void * refCon,
            const UINT8 * pData,
            UINT32 dataSize )
```

Copy data Update the data to be sent.

Parameters

in	*pPacket*	pointer to the packet element to send
in	*marshall*	pointer to marshalling function
in	*refCon*	reference for marshalling function
in	*pData*	pointer to data
in	*dataSize*	size of data

Return values

TRDP_NO_ERR	no error other errors

5.27.2.8 trdp_pdReceive()

```
TRDP_ERR_T trdp_pdReceive (
            TRDP_SESSION_PT appHandle,
            SOCKET 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, check if it is a PD Request (PULL). If it is an update, exchange the existing entry with the new one Call user's callback if needed

Parameters

in	*appHandle*	session pointer
in	*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

5.27.2.9 trdp_pdSend()

```
TRDP_ERR_T trdp_pdSend (
             SOCKET pdSock,
             PD_ELE_T * pPacket,
             UINT16 port )
```

Send one PD packet.

Parameters

in	*pdSock*	socket descriptor
in	*pPacket*	pointer to packet to be sent
in	*port*	port on which to send

Return values

TRDP_NO_ERR	
TRDP_IO_ERR	

5.27.2.10 trdp_pdSendElement()

```
TRDP_ERR_T trdp_pdSendElement (
             TRDP_SESSION_PT appHandle,
             PD_ELE_T ** ppElement )
```

Send a due PD message.

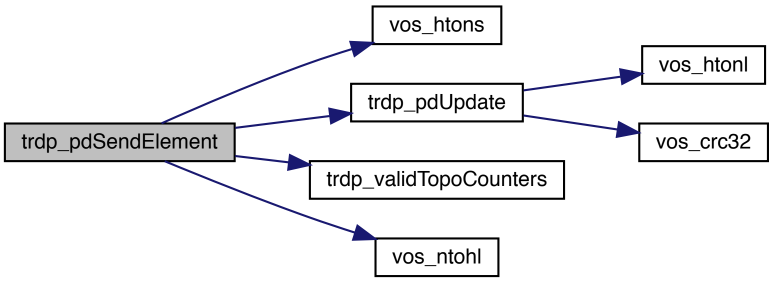
Parameters

in	*appHandle*	session pointer

Return values

TRDP_NO_ERR	no error
TRDP_IO_ERR	socket I/O error

Here is the call graph for this function:



5.27.2.11 trdp_pdSendImmediate()

```
TRDP_ERR_T trdp_pdSendImmediate (
            TRDP_SESSION_PT appHandle,
            PD_ELE_T * pSendPD )
```

Send PD message immediately.

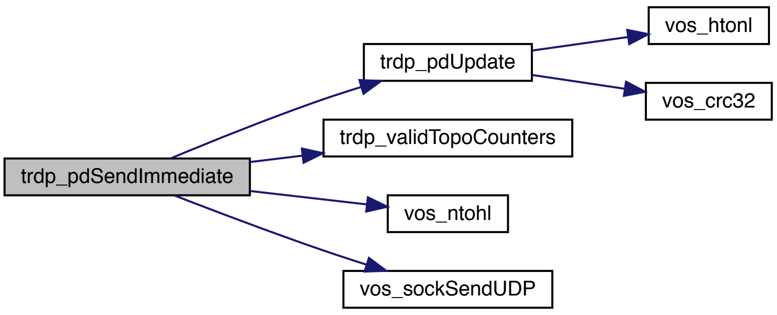
Parameters

in	*appHandle*	session pointer
in	*pSendPD*	pointer to element to be sent

Return values

TRDP_NO_ERR	no error
TRDP_IO_ERR	socket I/O error

Here is the call graph for this function:



5.27.2.12 trdp_pdSendQueued()

```
TRDP_ERR_T trdp_pdSendQueued (
            TRDP_SESSION_PT appHandle )
```

Send all due PD messages.

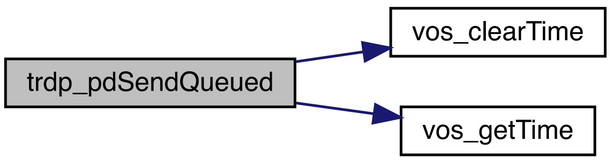
Parameters

in	*appHandle*	session pointer

Return values

TRDP_NO_ERR	no error
TRDP_IO_ERR	socket I/O error

Here is the call graph for this function:



5.27.2.13 trdp_pdUpdate()

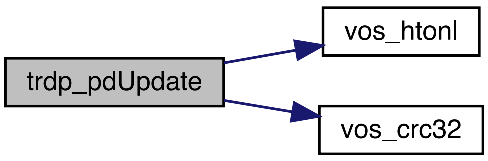
```
void trdp_pdUpdate (
            PD_ELE_T * pPacket )
```

Update the header values.

Parameters

in	*pPacket*	pointer to the packet to update

Here is the call graph for this function:

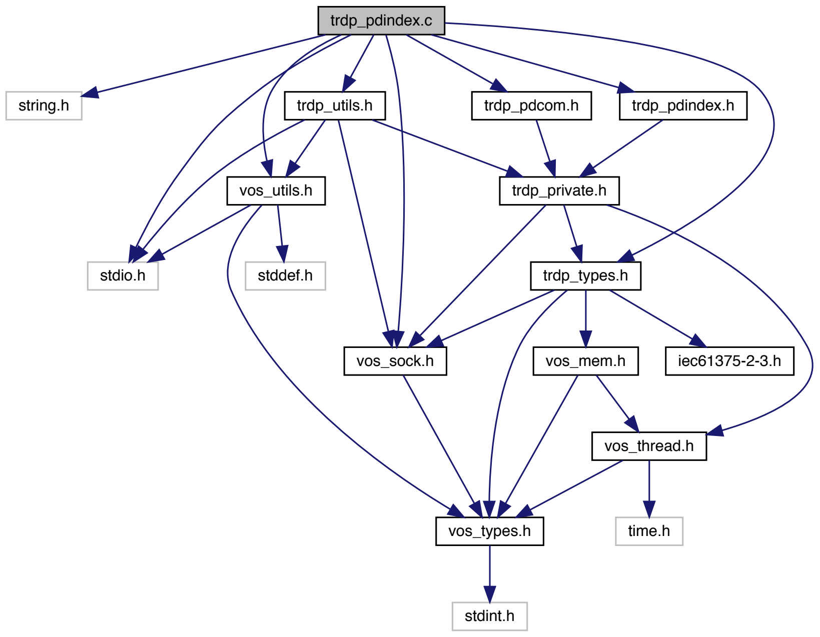


5.28 trdp_pdindex.c File Reference

Functions for indexed PD communication.

```
#include <string.h>
#include <stdio.h>
#include "trdp_types.h"
#include "trdp_utils.h"
#include "trdp_pdcom.h"
#include "vos_utils.h"
#include "vos_sock.h"
#include "trdp_pdindex.h"
```

Include dependency graph for trdp_pdindex.c:



5.28.1 Detailed Description

Functions for indexed PD communication.

Faster access to the internal process data telegram send and receive functions

Note

Project: TCNOpen TRDP prototype stack

Author

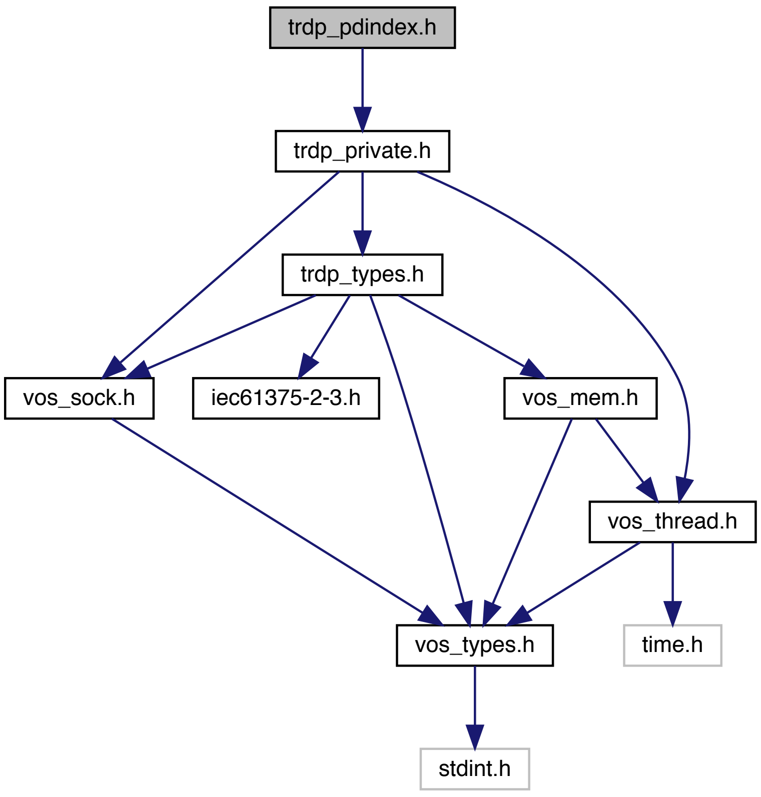
Bernd Loehr, NewTec GmbH

Remarks

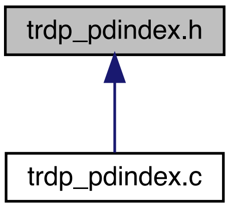
5.29 trdp_pdindex.h File Reference

Functions for indexed PD communication.

`#include "trdp_private.h"`
Include dependency graph for trdp_pdindex.h:



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



Data Structures

- struct hp_slot

  Low cycle-time slots.
- struct hp_slots

  entry for the application session

Macros

- #define TRDP_DEFAULT_CYCLE 1000u

  Supported and recomended cycle times for the tlp_processTransmit loop.

Typedefs

- typedef struct hp_slot TRDP_HP_CAT_SLOT_T

  Low cycle-time slots.
- typedef struct hp_slots TRDP_HP_CAT_SLOTS_T

  entry for the application session

5.29.1 Detailed Description

Functions for indexed PD communication.

Faster access to the internal process data telegram send and receive functions

Note

Project: TCNOpen TRDP prototype stack

Author

Bernd Loehr, NewTec GmbH

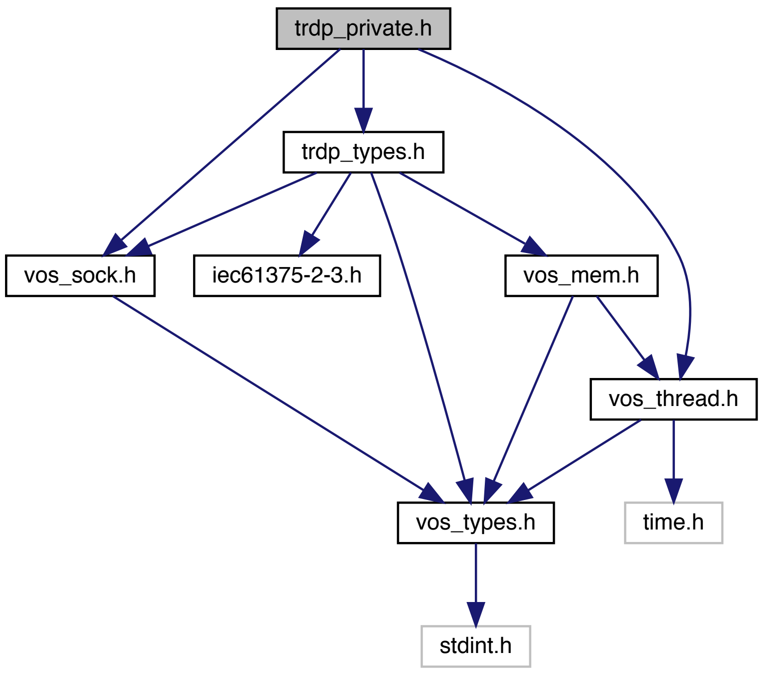
Remarks

5.30 trdp_private.h File Reference

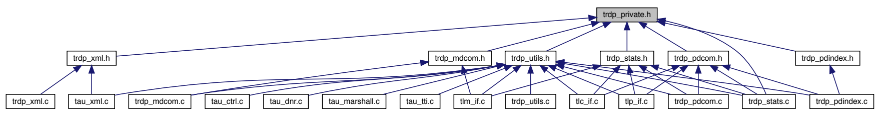
Typedefs for TRDP communication.

```
#include "trdp_types.h"
#include "vos_thread.h"
#include "vos_sock.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_SEQ_CNT_ENTRY_T

    Tuples of last received sequence counter per comId.
- struct TRDP_SOCKET_TCP

    TCP parameters.

- struct TRDP_SOCKETS

    Socket item.
- struct GNU_PACKED

    Types for ETB control.
- struct GNU_PACKED

    Types for ETB control.
- struct GNU_PACKED

    Types for ETB control.
- struct PD_ELE

    Queue element for PD packets to send or receive.
- struct TRDP_SESSION

    Session/application variables store.

Macros

- #define TRDP_TIMER_GRANULARITY 5000u

    granularity in us - we allow 5ms now!
- #define TRDP_MAX_PD_SOCKET_CNT VOS_MAX_SOCKET_CNT

    Separate PD and MD socket lists.
- #define TRDP_MD_MAN_CYCLE_TIME 5000u

    cycle time [us} = delay for outgoing MD
- #define TRDP_DEBUG_DEFAULT_FILE_SIZE 65536u

    Default maximum size of log file.
- #define TRDP_SEQ_CNT_START_ARRAY_SIZE 64u

    This should be enough for the start.
- #define TRDP_IF_WAIT_FOR_READY 120u

    120 seconds (120 tries each second to bind to an IP address)
- #define TRDP_PROTO_VER 0x0101u

    compatible protocol version with service Id
- #define TRDP_PRIV_NONE 0u

    Internal flags for packets.
- #define TRDP_TIMED_OUT 0x2u

    if set, inform the user
- #define TRDP_INVALID_DATA 0x4u

    if set, inform the user
- #define TRDP_REQ_2B_SENT 0x8u

    if set, the request needs to be sent
- #define TRDP_REDUNDANT 0x20u

    if set, packet should not be sent (redundant)
- #define TRDP_CHECK_COMID 0x40u

    if set, do filter comId (addListener)
- #define TRDP_IS_TSN 0x80u

    if set, PD will be sent on trdp_put() only

Typedefs

- typedef struct TRDP_HANDLE TRDP_ADDRESSES_T

    Hidden handle definition, used as unique addressing item.
- typedef struct TRDP_SOCKET_TCP TRDP_SOCKET_TCP_T

    TCP parameters.
- 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 TRDP_SESSION TRDP_SESSION_T

    Session/application variables store.

Enumerations

- enum TRDP_MD_ELE_ST_T {
  TRDP_ST_NONE = 0u,
  TRDP_ST_TX_NOTIFY_ARM = 1u,
  TRDP_ST_TX_REQUEST_ARM = 2u,
  TRDP_ST_TX_REPLY_ARM = 3u,
  TRDP_ST_TX_REPLYQUERY_ARM = 4u,
  TRDP_ST_TX_CONFIRM_ARM = 5u,
  TRDP_ST_RX_READY = 6,
  TRDP_ST_TX_REQUEST_W4REPLY = 7u,
  TRDP_ST_RX_REPLYQUERY_W4C = 8u,
  TRDP_ST_RX_REQ_W4AP_REPLY = 9u,
  TRDP_ST_TX_REQ_W4AP_CONFIRM = 10u,
  TRDP_ST_RX_REPLY_SENT = 11u,
  TRDP_ST_RX_NOTIFY_RECEIVED = 12u,
  TRDP_ST_TX_REPLY_RECEIVED = 13u,
  TRDP_ST_RX_CONF_RECEIVED = 14u }

    Internal MD state.
- enum TRDP_SOCK_TYPE_T {
  TRDP_SOCK_INVAL = 0u,
  TRDP_SOCK_PD = 1u,
  TRDP_SOCK_MD_UDP = 2u,
  TRDP_SOCK_MD_TCP = 3u,
  TRDP_SOCK_PD_TSN = 4u }

    Socket usage.

5.30.1 Detailed Description

Typedefs for TRDP communication.

TRDP internal type definitions

Note

Project: TCNOpen TRDP prototype stack

Author

Bernd Loehr, NewTec GmbH

Remarks

5.30.2 Macro Definition Documentation

5.30.2.1 TRDP_MAX_PD_SOCKET_CNT

```
#define TRDP_MAX_PD_SOCKET_CNT VOS_MAX_SOCKET_CNT
```

Separate PD and MD socket lists.

Reserve 1/4 of sockets for MD, if supported all available sockets for PD

5.30.3 Enumeration Type Documentation

5.30.3.1 TRDP_MD_ELE_ST_T

```
enum TRDP_MD_ELE_ST_T
```

Internal MD state.

Enumerator

TRDP_ST_NONE	neutral value
TRDP_ST_TX_NOTIFY_ARM	ready to send notify MD
TRDP_ST_TX_REQUEST_ARM	ready to send request MD
TRDP_ST_TX_REPLY_ARM	ready to send reply MD
TRDP_ST_TX_REPLYQUERY_ARM	ready to send reply with confirm request MD
TRDP_ST_TX_CONFIRM_ARM	ready to send confirm MD
TRDP_ST_RX_READY	armed listener
TRDP_ST_TX_REQUEST_W4REPLY	request sent, wait for reply
TRDP_ST_RX_REPLYQUERY_W4C	reply send, with confirm request MD
TRDP_ST_RX_REQ_W4AP_REPLY	request received, wait for application reply send
TRDP_ST_TX_REQ_W4AP_CONFIRM	reply conf. rq. tx, wait for application conf send
TRDP_ST_RX_REPLY_SENT	reply sent
TRDP_ST_RX_NOTIFY_RECEIVED	notification received, wait for application to accept
TRDP_ST_TX_REPLY_RECEIVED	reply received
TRDP_ST_RX_CONF_RECEIVED	confirmation received

5.30.3.2 TRDP_SOCK_TYPE_T

```
enum TRDP_SOCK_TYPE_T
```

Socket usage.

Enumerator

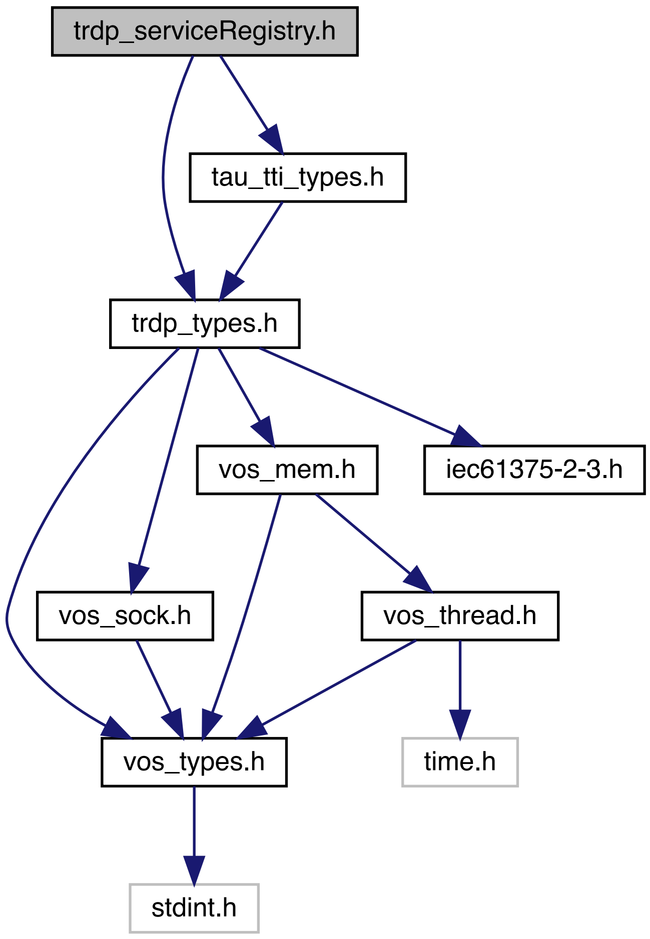
TRDP_SOCK_INVAL	Socket is undefined.
TRDP_SOCK_PD	Socket is used for UDP process data.
TRDP_SOCK_MD_UDP	Socket is used for UDP message data.
TRDP_SOCK_MD_TCP	Socket is used for TCP message data.
TRDP_SOCK_PD_TSN	Socket is used for TSN process data.

5.31 trdp_serviceRegistry.h File Reference

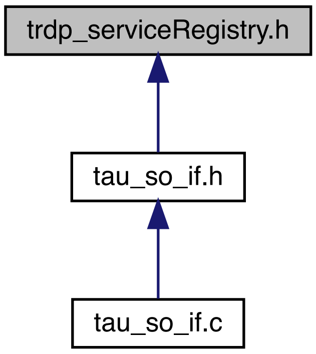
Additional definitions for IEC 61375-2-3 (Service Discovery) The definitions herein are preliminary and will change with the next major release of the IEC 61375-2-3 standard.

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

Include dependency graph for trdp_serviceRegistry.h:



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



Data Structures

- struct service_info

    Preliminary definition of a service info entry.
- struct srv_info_req

    Preliminary definition of a service info request.
- struct GNU_PACKED

    Types for ETB control.

Macros

- #define SRM_SRVINFO_NOTIFY_COMID 200u

    Additional defines to be reserved for SR Manager.
- #define SRM_SRVINFO_NOTIFY_URI "grpSRM.anyVeh.aCst.aClTrn.lTrn"

    multicast group
- #define SRM_SRVINFO_NOTIFY_DS "CST_SRV_INFO"

    SRM_CST_SRV_INFO_T.
- #define SRM_SRV_REQ_NOTIFY_COMID 201u

    SRVINFOREQ request data:
- #define SRM_SRV_REQ_NOTIFY_URI "grpSRM.anyVeh.aCst.aClTrn.lTrn"

    multicast group
- #define SRM_SRV_REQ_NOTIFY_DS "SRV_INFO_REQ"

    SRM_SRV_INFO_REQ_T.
- #define SRM_SERVICE_READ_REQ_COMID 112u

    Additional COMIDs to be reserved for SR Manager.
- #define SRM_SERVICE_READ_REQ_TO 3000000u

    [us] 3s timeout
- #define SRM_SERVICE_READ_REP_COMID 113u

    MD reply.
- #define SRM_SERVICE_READ_REP_DS "SRM_SERVICE_ENTRIES_T"

SRM_SERVICE_ENTRIES_T.
- #define SRM_SERVICE_READ_REP_DSID SRM_SERVICE_DSID

  SRM_SERVICE_ENTRIES_T.
- #define SRM_SERVICE_ADD_REQ_COMID 114u

  SRM manager telegram MD: Add service instance(s) to the Service Registry.
- #define SRM_SERVICE_ADD_REQ_TO 3000000u

  [us] 3s timeout
- #define SRM_SERVICE_ADD_REQ_DS "SRM_SERVICE_ENTRIES_T"

  SRM_SERVICE_ENTRIES_T.
- #define SRM_SERVICE_ADD_REQ_DSID SRM_SERVICE_DSID

  SRM_SERVICE_ENTRIES_T.
- #define SRM_SERVICE_ADD_REP_COMID 115u

  Reply returns instanceId.
- #define SRM_SERVICE_ADD_REP_DSID SRM_SERVICE_DSID

  SRM_SERVICE_ENTRIES_T.
- #define SRM_SERVICE_UPD_NOTIFY_COMID 116u

  SRM manager telegram MD: Update service instance(s) to the Service Registry.
- #define SRM_SERVICE_UPD_NOTIFY_TTL 3000000u

  [us] default time-to-live
- #define SRM_SERVICE_UPD_NOTIFY_DS "SRM_SERVICE_ENTRIES_T"

  SRM_SERVICE_ENTRIES_T.
- #define SRM_SERVICE_UPD_NOTIFY_DSID SRM_SERVICE_DSID

  SRM_SERVICE_ENTRIES_T.
- #define SRM_SERVICE_DEL_REQ_COMID 117u

  SRM manager telegram MD: Remove Service instance(s) from the Service Registry.
- #define SRM_SERVICE_DEL_REQ_TO 3000000u

  [us] 3s timeout
- #define SRM_SERVICE_DEL_REQ_DS "SRM_SERVICE_ENTRIES_T"

  SRM_SERVICE_ENTRIES_T.
- #define SRM_SERVICE_DEL_REQ_DSID SRM_SERVICE_DSID

  SRM_SERVICE_ENTRIES_T.
- #define SRM_SERVICE_DEL_REP_COMID 118u

  MD reply OK or not.
- #define SOA_SERVICEID(instId, typeId) ((instId) << 24 | (typeId))

  serviceId from instanceId and typeId
- #define SOA_TYPE(serviceId) ((serviceId) & 0xFFFFFF)

  return 24 Bit service type part of serviceId
- #define SOA_INST(serviceId) (((serviceId) >> 24) & 0xFF)

  return 8 Bit instance ID part of serviceId
- #define SOA_SAME_SERVICEID_OR0(a, b) (((a) == 0u) || ((a) == (b)))

  return TRUE if serviceId(a) is 0 or equals the second serviceId (b)
- #define SOA_SAME_SERVICEID(a, b) ((a) == (b))

  return TRUE if serviceIds (incl.
- #define SOA_SAME_SERVICE_TYPE(a, b) (SOA_TYPE(a) == SOA_TYPE(b))

  return TRUE if service types match

Typedefs

- typedef struct service_info SRM_SERVICE_INFO_T

  Preliminary definition of a service info entry.
- typedef struct srv_info_req SRM_SRV_INFO_REQ_T

  Preliminary definition of a service info request.

5.31.1 Detailed Description

Additional definitions for IEC 61375-2-3 (Service Discovery) The definitions herein are preliminary and will change with the next major release of the IEC 61375-2-3 standard.

Note

Project: CTA2 WP3 / TCNOpen TRDP

Author

Bernd Loehr, NewTec GmbH, 2019-04-08

Remarks

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5.31.2 Macro Definition Documentation

5.31.2.1 SOA_SAME_SERVICEID

```
#define SOA_SAME_SERVICEID(
              a,
              b ) ((a) == (b))
```

return TRUE if serviceIds (incl.

instance) match

5.31.2.2 SRM_SERVICE_READ_REQ_COMID

```
#define SRM_SERVICE_READ_REQ_COMID 112u
```

Additional COMIDs to be reserved for SR Manager.

Transport: MD over TCP preferred for reliability SRM manager telegram MD: Read Services from the Consist-local Service Registry

5.31.2.3 SRM_SRVINFO_NOTIFY_COMID

```
#define SRM_SRVINFO_NOTIFY_COMID 200u
```

Additional defines to be reserved for SR Manager.

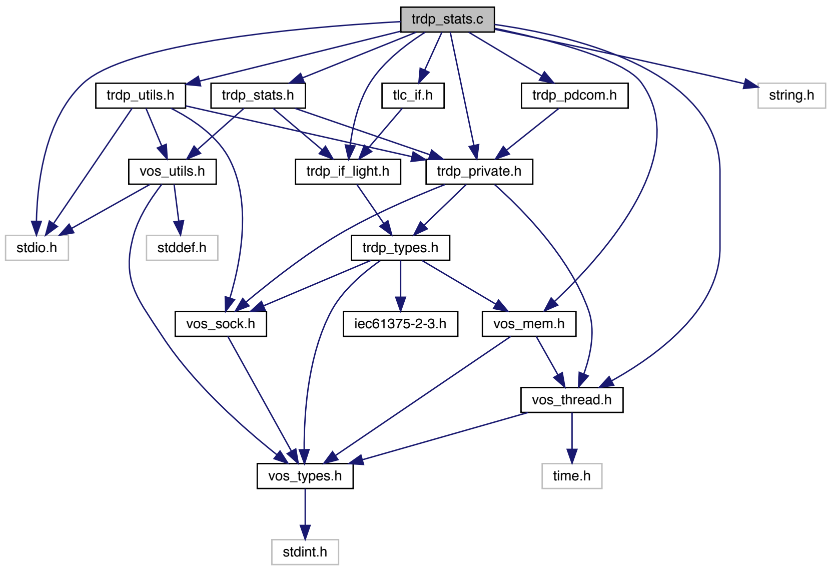
Transport: Trainwide MD over UDP / Multicast SRVINFO notification data:

5.32 trdp_stats.c File Reference

Statistics functions for TRDP communication.

```
#include <stdio.h>
#include <string.h>
#include "trdp_stats.h"
#include "trdp_if_light.h"
#include "tlc_if.h"
#include "trdp_private.h"
#include "trdp_pdcom.h"
#include "trdp_utils.h"
#include "vos_mem.h"
#include "vos_thread.h"
```

Include dependency graph for trdp_stats.c:



Functions

- void trdp_UpdateStats (TRDP_APP_SESSION_T appHandle)

  Update the statistics.
- void trdp_initStats (TRDP_APP_SESSION_T appHandle)

  Init statistics.
- EXT_DECL TRDP_ERR_T tlc_resetStatistics (TRDP_APP_SESSION_T appHandle)

  Reset statistics.
- EXT_DECL TRDP_ERR_T tlc_getStatistics (TRDP_APP_SESSION_T appHandle, TRDP_STATISTICS_T ∗pStatistics)

  Return statistics.
- EXT_DECL TRDP_ERR_T tlc_getSubsStatistics (TRDP_APP_SESSION_T appHandle, UINT16 ∗pNum←Subs, TRDP_SUBS_STATISTICS_T ∗pStatistics)

  Return PD subscription statistics.
- EXT_DECL TRDP_ERR_T tlc_getPubStatistics (TRDP_APP_SESSION_T appHandle, UINT16 ∗pNumPub, TRDP_PUB_STATISTICS_T ∗pStatistics)

Return PD publish statistics.

- EXT_DECL TRDP_ERR_T tlc_getRedStatistics (TRDP_APP_SESSION_T appHandle, UINT16 ∗pNumRed, TRDP_RED_STATISTICS_T ∗pStatistics)

    Return redundancy group statistics.
- EXT_DECL TRDP_ERR_T tlc_getJoinStatistics (TRDP_APP_SESSION_T appHandle, UINT16 ∗pNumJoin, UINT32 ∗pIpAddr)

    Return join statistics.
- void trdp_pdPrepareStats (TRDP_APP_SESSION_T appHandle, PD_ELE_T ∗pPacket)

    Fill the statistics packet.

5.32.1 Detailed Description

Statistics functions for TRDP communication.

Note

Project: TCNOpen TRDP prototype stack

Author

Bernd Loehr, NewTec GmbH

Remarks

5.32.2 Function Documentation

5.32.2.1 tlc_getJoinStatistics()

```
EXT_DECL TRDP_ERR_T tlc_getJoinStatistics (
            TRDP_APP_SESSION_T appHandle,
            UINT16 * pNumJoin,
            UINT32 * pIpAddr )
```

Return join statistics.

Memory for statistics information must be provided by the user.

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in,out	*pNumJoin*	Pointer to the number of joined IP Adresses
out	*pIpAddr*	Pointer to a list with the joined IP adresses

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid
TRDP_PARAM_ERR	parameter error
TRDP_MEM_ERR	there are more items than requested

5.32.2.2 tlc_getPubStatistics()

```
EXT_DECL TRDP_ERR_T tlc_getPubStatistics (
            TRDP_APP_SESSION_T appHandle,
            UINT16 * pNumPub,
            TRDP_PUB_STATISTICS_T * pStatistics )
```

Return PD publish statistics.

Memory for statistics information must be provided by the user.

Parameters

`in`	*appHandle*	the handle returned by tlc_openSession
`in,out`	*pNumPub*	Pointer to the number of publishers
`out`	*pStatistics*	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
TRDP_MEM_ERR	there are more subscriptions than requested

5.32.2.3 tlc_getRedStatistics()

```
EXT_DECL TRDP_ERR_T tlc_getRedStatistics (
            TRDP_APP_SESSION_T appHandle,
            UINT16 * pNumRed,
            TRDP_RED_STATISTICS_T * pStatistics )
```

Return redundancy group statistics.

Memory for statistics information must be provided by the user.

Parameters

`in`	*appHandle*	the handle returned by tlc_openSession
`in,out`	*pNumRed*	Pointer to the number of redundancy groups
`out`	*pStatistics*	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
TRDP_MEM_ERR	there are more subscriptions than requested

5.32.2.4 tlc_getStatistics()

```
EXT_DECL TRDP_ERR_T tlc_getStatistics (
            TRDP_APP_SESSION_T appHandle,
            TRDP_STATISTICS_T * pStatistics )
```

Return statistics.

Memory for statistics information must be provided by the user.

Parameters

in	*appHandle*	the handle returned by tlc_openSession
out	*pStatistics*	Pointer to statistics for this application session

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid
TRDP_PARAM_ERR	parameter error

5.32.2.5 tlc_getSubsStatistics()

```
EXT_DECL TRDP_ERR_T tlc_getSubsStatistics (
            TRDP_APP_SESSION_T appHandle,
            UINT16 * pNumSubs,
            TRDP_SUBS_STATISTICS_T * pStatistics )
```

Return PD subscription statistics.

Memory for statistics information must be provided by the user.

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in,out	*pNumSubs*	In: The number of subscriptions requested Out: Number of subscriptions returned
in,out	*pStatistics*	Pointer to an array with the subscription statistics information

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid
TRDP_PARAM_ERR	parameter error
TRDP_MEM_ERR	there are more subscriptions than requested

5.32.2.6 tlc_resetStatistics()

```
EXT_DECL TRDP_ERR_T tlc_resetStatistics (
             TRDP_APP_SESSION_T appHandle )
```

Reset statistics.

Parameters

in	*appHandle*	the handle returned by tlc_openSession

Return values

TRDP_NO_ERR	no error
TRDP_NOINIT_ERR	handle invalid
TRDP_PARAM_ERR	parameter error

5.32.2.7 trdp_initStats()

```
void trdp_initStats (
             TRDP_APP_SESSION_T appHandle )
```

Init statistics.

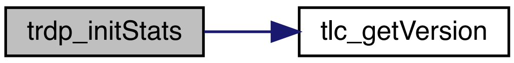
Clear the stats structure for a session.

Parameters

in	*appHandle*	the handle returned by tlc_openSession

< host name

< leader host name Here is the call graph for this function:



5.32.2.8 trdp_pdPrepareStats()

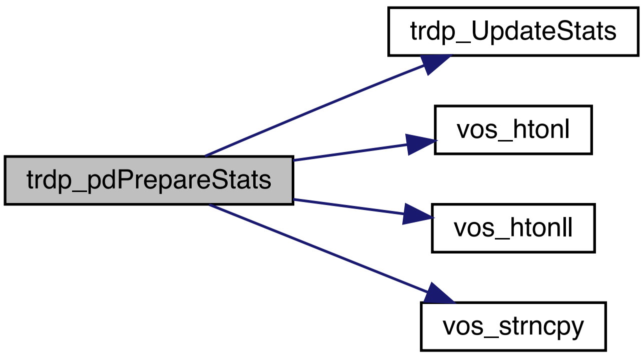
```
void trdp_pdPrepareStats (
             TRDP_APP_SESSION_T appHandle,
             PD_ELE_T * pPacket )
```

Fill the statistics packet.

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in,out	*pPacket*	pointer to the packet to fill

Here is the call graph for this function:



5.32.2.9 trdp_UpdateStats()

```
void trdp_UpdateStats (
            TRDP_APP_SESSION_T appHandle )
```

Update the statistics.

Parameters

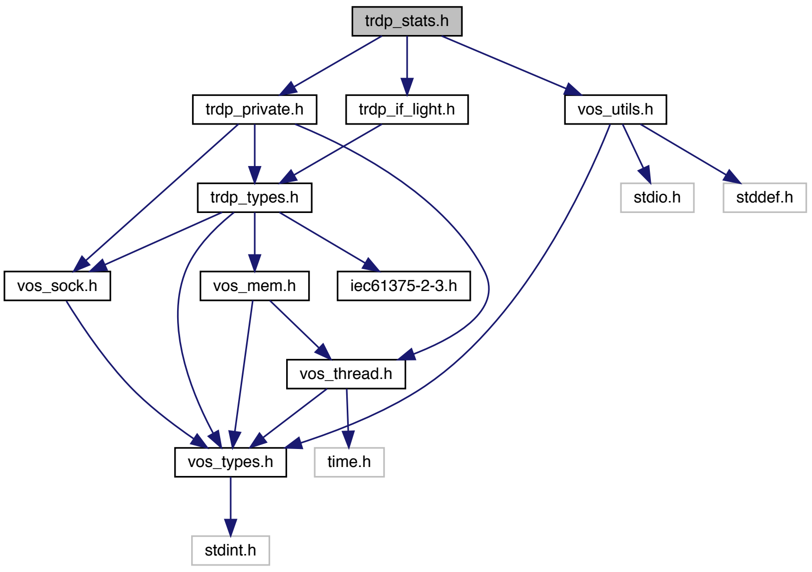
in	*appHandle*	the handle returned by tlc_openSession

5.33 trdp_stats.h File Reference

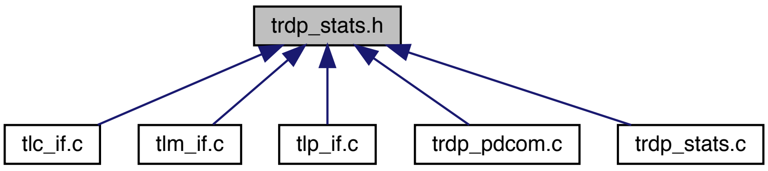
Statistics for TRDP communication.

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



Functions

- void trdp_initStats (TRDP_APP_SESSION_T appHandle)

  Init statistics.
- void trdp_pdPrepareStats (TRDP_APP_SESSION_T appHandle, PD_ELE_T ∗pPacket)

  Fill the statistics packet.

5.33.1 Detailed Description

Statistics for TRDP communication.

Note

Project: TCNOpen TRDP prototype stack

Author

Bernd Loehr, NewTec GmbH

Remarks

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5.33.2 Function Documentation

5.33.2.1 trdp_initStats()

```
void trdp_initStats (
            TRDP_APP_SESSION_T appHandle )
```

Init statistics.

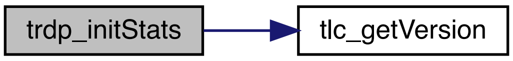
Clear the stats structure for a session.

Parameters

in	*appHandle*	the handle returned by tlc_openSession

< host name

< leader host name Here is the call graph for this function:



5.33.2.2 trdp_pdPrepareStats()

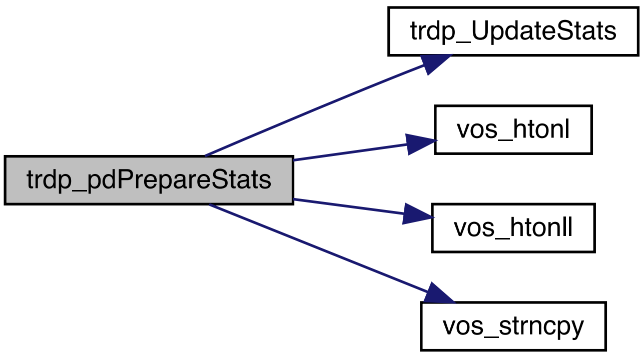
```
void trdp_pdPrepareStats (
            TRDP_APP_SESSION_T appHandle,
            PD_ELE_T * pPacket )
```

Fill the statistics packet.

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in,out	*pPacket*	pointer to the packet to fill

Here is the call graph for this function:



5.34 trdp_tsn_def.h File Reference

Additional definitions for TSN.

Macros

- #define TRDP_MD_DEFAULT_QOS 2u

  matching new proposed priority classes
- #define TRDP_PD_DEFAULT_QOS 2u

  Default PD communication parameters.
- #define TRDP_PD_DEFAULT_TSN_PRIORITY 3u

  matching new proposed priority classes
- #define TRDP_PD_DEFAULT_TSN FALSE

  matching new proposed priority classes
- #define TRDP_MIN_PD2_HEADER_SIZE sizeof(PD2_HEADER_T)

  PD packet properties.
- #define TRDP_MAX_PD2_DATA_SIZE 1458u

  PD2 data.
- #define TRDP_MSG_TSN_PD 0x01u

  New Message Types for TRDP Version 2 TSN-PDU (preliminary)
- #define TRDP_MSG_TSN_PD_SDT 0x02u

  TSN safe PD Data.
- #define TRDP_MSG_TSN_PD_MSDT 0x03u

  TSN multiple SDT PD Data.
- #define TRDP_MSG_TSN_PD_RES 0x04u

  TSN reserved.
- #define TRDP_VER_TSN_PROTO 0x02u

  Protocol version for TSN.

5.34.1 Detailed Description

Additional definitions for TSN.

This header file defines proposed extensions and additions to IEC61375-2-3:2017 The definitions herein are preliminary and may change with the next major release of the IEC 61375-2-3 standard.

Note

Project: TCNOpen TRDP prototype stack & FDF/DbD

Author

Bernd Loehr, NewTec GmbH, 2019-02-19

Remarks

Copyright 2019, NewTec GmbH

Id

trdp_tsn_def.h 1932 2019-07-03 15:31:16Z bloehr

5.34.2 Macro Definition Documentation

5.34.2.1 TRDP_MIN_PD2_HEADER_SIZE

```
#define TRDP_MIN_PD2_HEADER_SIZE sizeof(PD2_HEADER_T)
```

PD packet properties.

TSN header size with FCS

5.34.2.2 TRDP_MSG_TSN_PD

```
#define TRDP_MSG_TSN_PD 0x01u
```

New Message Types for TRDP Version 2 TSN-PDU (preliminary)

TSN non safe PD Data

5.34.2.3 TRDP_PD_DEFAULT_QOS

```
#define TRDP_PD_DEFAULT_QOS 2u
```

Default PD communication parameters.

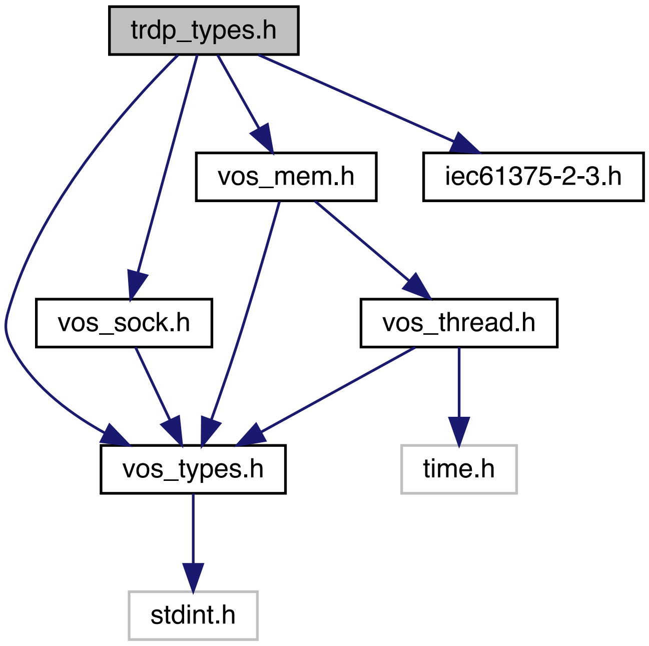
matching new proposed priority classes

5.35 trdp_types.h File Reference

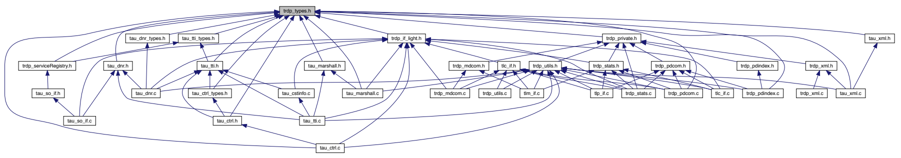
Typedefs for TRDP communication.

```
#include "vos_types.h"
#include "vos_mem.h"
#include "vos_sock.h"
```

`#include "iec61375-2-3.h"`
Include dependency graph for trdp_types.h:



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



Data Structures

- struct TRDP_PD_INFO_T

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

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

  Quality/type of service, time to live , no.
- struct TRDP_DATASET_ELEMENT_T

  Dataset element definition.
- struct TRDP_DATASET

  Dataset definition.
- struct TRDP_COMID_DSID_MAP_T

ComId - data set mapping element definition.

- struct GNU_PACKED

    Types for ETB control.
- struct GNU_PACKED

    Types for ETB control.
- struct GNU_PACKED

    Types for ETB control.
- struct GNU_PACKED

    Types for ETB control.
- struct GNU_PACKED

    Types for ETB control.
- struct GNU_PACKED

    Types for ETB control.
- struct GNU_PACKED

    Types for ETB control.
- struct GNU_PACKED

    Types for ETB control.
- struct GNU_PACKED

    Types for ETB control.
- 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

    Enumeration type for memory pre-fragmentation, reuse of VOS definition.
- struct TRDP_PROCESS_CONFIG_T

    Various flags/general TRDP options for library initialization.

Macros

- #define USE_HEAP 0

    If this is set, we can allocate dynamically memory.
- #define TRDP_FLAGS_DEFAULT 0u

    Various flags for PD and MD packets.
- #define TRDP_FLAGS_NONE 0x01u

    No flags set.
- #define TRDP_FLAGS_MARSHALL 0x02u

    Optional marshalling/unmarshalling in TRDP stack.
- #define TRDP_FLAGS_CALLBACK 0x04u

    Use of callback function.
- #define TRDP_FLAGS_TCP 0x08u

    Use TCP for message data.
- #define TRDP_FLAGS_FORCE_CB 0x10u

    Force a callback for every received packet.
- #define TRDP_FLAGS_TSN 0x20u

    Hard Real Time PD.
- #define TRDP_FLAGS_TSN_SDT 0x40u

    SDT PD.

- #define TRDP_FLAGS_TSN_MSDT 0x80u

    Multi SDT PD.
- #define TRDP_INFINITE_TIMEOUT 0xffffffffu

    Infinite reply timeout.
- #define TRDP_DEFAULT_PD_TIMEOUT 100000u

    Default PD timeout 100ms from 61375-2-3 Table C.7.
- #define TRDP_BOOL8 TRDP_BITSET8

    1 bit relevant (equal to zero = false, not equal to zero = true)
- #define TRDP_ANTIVALENT8 TRDP_BITSET8

    2 bit relevant (0x0 = errror, 0x01 = false, 0x02 = true, 0x03 undefined)
- #define TRDP_OPTION_NONE 0u

    Various flags/general TRDP options for library initialization.
- #define TRDP_OPTION_BLOCK 0x01u

    Default: Use nonblocking I/O calls, polling necessary Set: Read calls will block, use select()
- #define TRDP_OPTION_TRAFFIC_SHAPING 0x02u

    Use traffic shaping - distribute packet sending Default: OFF.
- #define TRDP_OPTION_NO_REUSE_ADDR 0x04u

    Do not allow re-use of address/port (-> no multihoming) Default: Allow.
- #define TRDP_OPTION_NO_MC_LOOP_BACK 0x08u

    Do not allow loop back of multicast traffic Default: Allow.
- #define TRDP_OPTION_NO_UDP_CHK 0x10u

    Suppress UDP CRC generation Default: Compute UDP CRC.
- #define TRDP_OPTION_WAIT_FOR_DNR 0x20u

    Wait for DNR Default: Don't wait.
- #define TRDP_OPTION_NO_PD_STATS 0x40u

    Suppress PD statistics \ Default: Don't suppress.
- #define TRDP_OPTION_DEFAULT_CONFIG 0x80u

    no XML process config, defaults were used

Typedefs

- typedef VOS_IP4_ADDR_T TRDP_IP_ADDR_T

    TRDP general type definitions.
- typedef CHAR8 TRDP_NET_LABEL_T[TRDP_MAX_LABEL_LEN]

    Definition for usage in network packets, not necessarily \0 terminated!
- typedef VOS_VERSION_T TRDP_VERSION_T

    Version information.
- typedef VOS_TIMEVAL_T TRDP_TIME_T

    Timer value compatible with timeval / select.
- typedef VOS_FDS_T 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 struct TRDP_DATASET TRDP_DATASET_T

    Dataset definition.
- typedef TRDP_DATASET_T ∗ pTRDP_DATASET_T

    Array of pointers to dataset.
- 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, UINT8 ∗pSrc, UINT32 srcSize, UINT8 ∗pDst, UINT32 ∗pDstSize, TRDP_DATASET_T ∗∗ppCachedDS)

  Function type for marshalling .
- typedef TRDP_ERR_T(∗ TRDP_UNMARSHALL_T) (void ∗pRefCon, UINT32 comId, UINT8 ∗pSrc, UINT32 srcSize, UINT8 ∗pDst, UINT32 ∗pDstSize, TRDP_DATASET_T ∗∗ppCachedDS)

  Function type for unmarshalling.
- typedef void(∗ TRDP_PD_CALLBACK_T) (void ∗pRefCon, TRDP_APP_SESSION_T appHandle, 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, TRDP_APP_SESSION_T appHandle, const TRDP_MD_INFO_T ∗pMsg, UINT8 ∗pData, UINT32 dataSize)

  Callback for receiving indications, timeouts, releases, responses.

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_THREAD_ERR = -13,
  TRDP_BLOCK_ERR = -14,
  TRDP_INTEGRATION_ERR = -15,
  TRDP_NOCONN_ERR = -16,
  TRDP_NOSESSION_ERR = -30,
  TRDP_SESSION_ABORT_ERR = -31,
  TRDP_NOSUB_ERR = -32,
  TRDP_NOPUB_ERR = -33,
  TRDP_NOLIST_ERR = -34,
  TRDP_CRC_ERR = -35,
  TRDP_WIRE_ERR = -36,
  TRDP_TOPO_ERR = -37,
  TRDP_COMID_ERR = -38,
  TRDP_STATE_ERR = -39,
  TRDP_APP_TIMEOUT_ERR = -40,
  TRDP_APP_REPLYTO_ERR = -41,
  TRDP_APP_CONFIRMTO_ERR = -42,
  TRDP_REPLYTO_ERR = -43,
  TRDP_CONFIRMTO_ERR = -44,
  TRDP_REQCONFIRMTO_ERR = -45,
  TRDP_PACKET_ERR = -46,
  TRDP_UNRESOLVED_ERR = -47,
  TRDP_XML_PARSER_ERR = -48,
  TRDP_INUSE_ERR = -49,
  TRDP_MARSHALLING_ERR = -50,
  TRDP_UNKNOWN_ERR = -99 }

Return codes for all API functions, -1..-29 taken over from vos.

- enum TRDP_REPLY_STATUS_T

  TRDP data transfer type definitions.
- enum TRDP_RED_STATE_T {
  TRDP_RED_FOLLOWER = 0u,
  TRDP_RED_LEADER = 1u }

  Redundancy states.
- enum TRDP_TO_BEHAVIOR_T {
  TRDP_TO_DEFAULT = 0u,
  TRDP_TO_SET_TO_ZERO = 1u,
  TRDP_TO_KEEP_LAST_VALUE = 2u }

  How invalid PD shall be handled.
- enum TRDP_DATA_TYPE_T {
  TRDP_INVALID = 0u,
  TRDP_BITSET8 = 1u,
  TRDP_CHAR8 = 2u,
  TRDP_UTF16 = 3u,
  TRDP_INT8 = 4u,
  TRDP_INT16 = 5u,
  TRDP_INT32 = 6u,
  TRDP_INT64 = 7u,
  TRDP_UINT8 = 8u,
  TRDP_UINT16 = 9u,
  TRDP_UINT32 = 10u,
  TRDP_UINT64 = 11u,
  TRDP_REAL32 = 12u,
  TRDP_REAL64 = 13u,
  TRDP_TIMEDATE32 = 14u,
  TRDP_TIMEDATE48 = 15u,
  TRDP_TIMEDATE64 = 16u,
  TRDP_TYPE_MAX = 30u }

  TRDP dataset description definitions.

5.35.1 Detailed Description

Typedefs for TRDP communication.

Note

Project: TCNOpen TRDP prototype stack

Author

Bernd Loehr, NewTec GmbH

Remarks

5.35.2 Macro Definition Documentation

5.35.2.1 TRDP_FLAGS_DEFAULT

```
#define TRDP_FLAGS_DEFAULT 0u
```

Various flags for PD and MD packets.

Default value defined in tlc_openDession will be taken

5.35.3 Typedef Documentation

5.35.3.1 TRDP_IP_ADDR_T

```
typedef VOS_IP4_ADDR_T TRDP_IP_ADDR_T
```

TRDP general type definitions.

5.35.3.2 TRDP_MARSHALL_T

```
typedef TRDP_ERR_T(* TRDP_MARSHALL_T) (void *pRefCon, UINT32 comId, UINT8 *pSrc, UINT32 src←
Size, UINT8 *pDst, UINT32 *pDstSize, TRDP_DATASET_T **ppCachedDS)
```

Function type for marshalling .

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

Parameters

in	*pRefCon*	pointer to user context
in	*comId*	ComId to identify the structure out of a configuration
in	*pSrc*	pointer to received original message
in	*srcSize*	size of the source buffer
in	*pDst*	pointer to a buffer for the treated message
in,out	*pDstSize*	size of the provide buffer / size of the treated message
in,out	*ppCachedDS*	pointer to pointer of cached dataset

Return values

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

5.35.3.3 TRDP_MD_CALLBACK_T

```
typedef void(∗ TRDP_MD_CALLBACK_T) (void ∗pRefCon, TRDP_APP_SESSION_T appHandle, const TRDP_MD_INFO_T
∗pMsg, UINT8 ∗pData, UINT32 dataSize)
```

Callback for receiving indications, timeouts, releases, responses.

Parameters

in	*appHandle*	handle returned also by tlc_init
in	*pRefCon*	pointer to user context
in	*pMsg*	pointer to received message information
in	*pData*	pointer to received data
in	*dataSize*	size of received data pointer to received data

5.35.3.4 TRDP_PD_CALLBACK_T

```
typedef void(∗ TRDP_PD_CALLBACK_T) (void ∗pRefCon, TRDP_APP_SESSION_T appHandle, const TRDP_PD_INFO_T
∗pMsg, UINT8 ∗pData, UINT32 dataSize)
```

Callback for receiving indications, timeouts, releases, responses.

Parameters

in	*pRefCon*	pointer to user context
in	*appHandle*	application handle returned by tlc_openSession
in	*pMsg*	pointer to received message information
in	*pData*	pointer to received data
in	*dataSize*	size of received data pointer to received data

5.35.3.5 TRDP_PRINT_DBG_T

```
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.

5.35.3.6 TRDP_TIME_T

```
typedef VOS_TIMEVAL_T TRDP_TIME_T
```

Timer value compatible with timeval / select.

Relative or absolute date, depending on usage

5.35.3.7 TRDP_UNMARSHALL_T

```
typedef TRDP_ERR_T(* TRDP_UNMARSHALL_T) (void *pRefCon, UINT32 comId, UINT8 *pSrc, UINT32 src←
Size, UINT8 *pDst, UINT32 *pDstSize, TRDP_DATASET_T **ppCachedDS)
```

Function type for unmarshalling.

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

Parameters

in	*pRefCon*	pointer to user context
in	*comId*	ComId to identify the structure out of a configuration
in	*pSrc*	pointer to received original message
in	*srcSize*	data length from TRDP packet header
in	*pDst*	pointer to a buffer for the treated message
in,out	*pDstSize*	size of the provide buffer / size of the treated message
in,out	*ppCachedDS*	pointer to pointer of cached dataset

Return values

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

5.35.4 Enumeration Type Documentation

5.35.4.1 TRDP_DATA_TYPE_T

```
enum TRDP_DATA_TYPE_T
```

TRDP dataset description definitions.

Dataset element definition

Enumerator

TRDP_INVALID	Invalid/unknown.
TRDP_BITSET8	=UINT8
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.

Enumerator

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_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 microseconds
TRDP_TYPE_MAX	Values greater are considered nested datasets.

5.35.4.2 TRDP_ERR_T

`enum TRDP_ERR_T`

Return codes for all API functions, -1..-29 taken over from vos.

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	Timout.
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_THREAD_ERR	Thread error.
TRDP_BLOCK_ERR	System call would have blocked in blocking mode.
TRDP_INTEGRATION_ERR	Alignment or endianess for selected target wrong.
TRDP_NOCONN_ERR	No TCP connection.
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_WIRE_ERR	Wire.
TRDP_TOPO_ERR	Invalid topo count.
TRDP_COMID_ERR	Unknown ComId.
TRDP_STATE_ERR	Call in wrong state.
TRDP_APP_TIMEOUT_ERR	Application Timeout.
TRDP_APP_REPLYTO_ERR	Application Reply Sent Timeout.

Enumerator

TRDP_APP_CONFIRMTO_ERR	Application Confirm Sent Timeout.
TRDP_REPLYTO_ERR	Protocol Reply Timeout.
TRDP_CONFIRMTO_ERR	Protocol Confirm Timeout.
TRDP_REQCONFIRMTO_ERR	Protocol Confirm Timeout (Request sender)
TRDP_PACKET_ERR	Incomplete message data packet.
TRDP_UNRESOLVED_ERR	DNR: address could not be resolved.
TRDP_XML_PARSER_ERR	Returned by the tau_xml subsystem.
TRDP_INUSE_ERR	Resource is still in use.
TRDP_MARSHALLING_ERR	Source size exceeded, dataset mismatch.
TRDP_UNKNOWN_ERR	Unspecified error.

5.35.4.3 TRDP_RED_STATE_T

```
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.

5.35.4.4 TRDP_REPLY_STATUS_T

```
enum TRDP_REPLY_STATUS_T
```

TRDP data transfer type definitions.

Reply status messages

5.35.4.5 TRDP_TO_BEHAVIOR_T

```
enum TRDP_TO_BEHAVIOR_T
```

How invalid PD shall be handled.

Enumerator

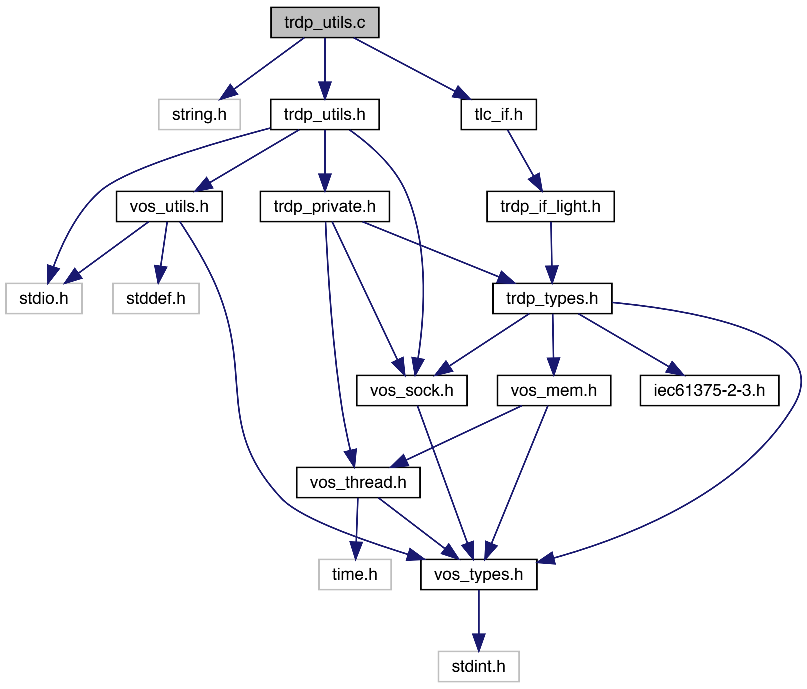
TRDP_TO_DEFAULT	Default value defined in tlc_openDession will be taken.
TRDP_TO_SET_TO_ZERO	If set, data will be reset to zero on time out.
TRDP_TO_KEEP_LAST_VALUE	If set, last received values will be returned.

5.36 trdp_utils.c File Reference

Helper functions for TRDP communication.

```
#include <string.h>
#include "tlc_if.h"
#include "trdp_utils.h"
```

Include dependency graph for trdp_utils.c:



Functions

- void printSocketUsage (TRDP_SOCKETS_T iface[ ])

  Debug socket usage output.
- BOOL8 trdp_SockIsJoined (const TRDP_IP_ADDR_T mcList[VOS_MAX_MULTICAST_CNT], TRDP_IP_ADDR_T mcGroup)

  Check if a mc group is in the list.
- BOOL8 trdp_SockAddJoin (TRDP_IP_ADDR_T mcList[VOS_MAX_MULTICAST_CNT], TRDP_IP_ADDR_T mcGroup)

  Add mc group to the list.
- BOOL8 trdp_SockDelJoin (TRDP_IP_ADDR_T mcList[VOS_MAX_MULTICAST_CNT], TRDP_IP_ADDR_T mcGroup)

  remove mc group from the list
- TRDP_IP_ADDR_T trdp_findMCjoins (TRDP_APP_SESSION_T appHandle, TRDP_IP_ADDR_T mcGroup)

  Check an MC group not used by other sockets / subscribers/ listeners.
- UINT32 trdp_packetSizePD (UINT32 dataSize)

  Get the packet size from the raw data size.
- UINT32 trdp_packetSizeMD (UINT32 dataSize)

Get the packet size from the raw data size.

- PD_ELE_T ∗ trdp_queueFindComId (PD_ELE_T ∗pHead, UINT32 comId)

    Return the element with same comId.
- PD_ELE_T ∗ trdp_queueFindPubAddr (PD_ELE_T ∗pHead, TRDP_ADDRESSES_T ∗addr)

    Return the element with same comId, serviceId and IP addresses.
- PD_ELE_T ∗ trdp_queueFindSubAddr (PD_ELE_T ∗pHead, TRDP_ADDRESSES_T ∗addr)

    Return the element with same comId and IP addresses.
- PD_ELE_T ∗ trdp_findSubAddr (PD_ELE_T ∗pHead, TRDP_ADDRESSES_T ∗addr, UINT32 comId)

    Return the element with same comId and IP addresses.
- PD_ELE_T ∗ trdp_queueFindExistingSub (PD_ELE_T ∗pHead, TRDP_ADDRESSES_T ∗addr)

    Return the element with same comId and IP addresses.
- void trdp_queueDelElement (PD_ELE_T ∗∗ppHead, PD_ELE_T ∗pDelete)

    Delete an element.
- BOOL8 trdp_validTopoCounters (UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, UINT32 etbTopoCntFilter, U←
INT32 opTrnTopoCntFilter)

    Check topography counters The applied conformance pattern follows Table A.5/A.21 (positive match): Telegram to be sent Locally stored value (appSession) Case etbTopoCnt opTrnTopoCnt etbTopoCntFilter opTrnTopoCntFilter 1 any any 0 0 2 any equal 0 equal 3 equal any equal 0 4 equal equal equal equal.
- void trdp_queueAppLast (PD_ELE_T ∗∗ppHead, PD_ELE_T ∗pNew)

    Append an element at end of queue.
- void trdp_queueInsFirst (PD_ELE_T ∗∗ppHead, PD_ELE_T ∗pNew)

    Insert an element at front of queue.
- void trdp_initSockets (TRDP_SOCKETS_T iface[ ], UINT8 noOfEntries)

    Handle the socket pool: Initialize it.
- TRDP_ERR_T trdp_requestSocket (TRDP_SOCKETS_T iface[ ], UINT16 port, const TRDP_SEND_PARAM_T ∗params, TRDP_IP_ADDR_T srcIP, TRDP_IP_ADDR_T mcGroup, TRDP_SOCK_TYPE_T type, TRDP_←
OPTION_T options, BOOL8 rcvMostly, SOCKET useSocket, INT32 ∗pIndex, TRDP_IP_ADDR_T cornerIp)

    Handle the socket pool: Request a socket from our socket pool First we loop through the socket pool and check if there is already a socket which would suit us.
- void trdp_releaseSocket (TRDP_SOCKETS_T iface[ ], INT32 lIndex, UINT32 connectTimeout, BOOL8 checkAll, TRDP_IP_ADDR_T mcGroupUsed)

    Handle the socket pool: if a received TCP socket is unused, the socket connection timeout is started.
- UINT32 trdp_getSeqCnt (UINT32 comId, TRDP_MSG_T msgType, TRDP_IP_ADDR_T srcIpAddr)

    Get the initial sequence counter for the comID/message type and subnet (source IP).
- void trdp_resetSequenceCounter (PD_ELE_T ∗pElement, TRDP_IP_ADDR_T srcIP, TRDP_MSG_T msg←
Type)

    remove the sequence counter for the comID/source IP.
- int trdp_checkSequenceCounter (PD_ELE_T ∗pElement, UINT32 sequenceCounter, TRDP_IP_ADDR_T srcIP, TRDP_MSG_T msgType)

    check and update the sequence counter for the comID/source IP.
- BOOL8 trdp_isAddressed (const TRDP_URI_USER_T listUri, const TRDP_URI_USER_T destUri)

    Check if listener URI is in addressing range of destination URI.
- BOOL8 trdp_isInIPrange (TRDP_IP_ADDR_T receivedSrcIP, TRDP_IP_ADDR_T listenedSourceIPlow, TRDP_IP_ADDR_T listenedSourceIPhigh)

    Check if received IP is in addressing range of listener's IPs.

5.36.1 Detailed Description

Helper functions for TRDP communication.

Note

Project: TCNOpen TRDP prototype stack

Author

Bernd Loehr, NewTec GmbH

Remarks

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5.36.2 Function Documentation

5.36.2.1 printSocketUsage()

```
void printSocketUsage (
            TRDP_SOCKETS_T iface[] )
```

Debug socket usage output.

Parameters

in	*iface*	List of sockets

5.36.2.2 trdp_checkSequenceCounter()

```
int trdp_checkSequenceCounter (
            PD_ELE_T * pElement,
            UINT32 sequenceCounter,
            TRDP_IP_ADDR_T srcIP,
            TRDP_MSG_T msgType )
```

check and update the sequence counter for the comID/source IP.

If the comID/srcIP is not found, update it and return 0 - else if already received, return 1 On memory error, return -1

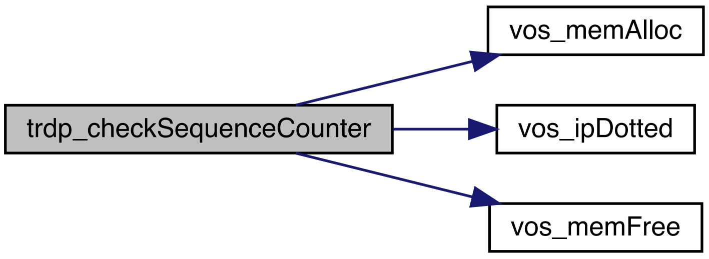
Parameters

in	*pElement*	subscription element
in	*sequenceCounter*	sequence counter to check
in	*srcIP*	Source IP address
in	*msgType*	type of the message

Return values

0	- no duplicate 1 - duplicate or old sequence counter -1 - memory error

Here is the call graph for this function:



5.36.2.3 trdp_findMCjoins()

```
TRDP_IP_ADDR_T trdp_findMCjoins (
             TRDP_APP_SESSION_T appHandle,
             TRDP_IP_ADDR_T mcGroup )
```

Check an MC group not used by other sockets / subscribers/ listeners.

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*mcGroup*	multicast group to look for

Return values

multi	cast group if unused VOS_INADDR_ANY if used

5.36.2.4 trdp_findSubAddr()

```
PD_ELE_T* trdp_findSubAddr (
             PD_ELE_T * pHead,
             TRDP_ADDRESSES_T * addr,
             UINT32 comId )
```

Return the element with same comId and IP addresses.

Parameters

in	*pHead*	pointer to head of queue
in	*addr*	Pub/Sub handle (Address, ComID, srcIP & dest IP, serviceId) to search for
in	*comId*	ComId to stay on on a sorted search, 0 when searching on unsorted queues

Return values

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

5.36.2.5 trdp_getSeqCnt()

```
UINT32 trdp_getSeqCnt (
            UINT32 comId,
            TRDP_MSG_T msgType,
            TRDP_IP_ADDR_T srcIpAddr )
```

Get the initial sequence counter for the comID/message type and subnet (source IP).

If the comID/srcIP is not found elsewhere, return 0 - else return its current sequence number (the redundant packet needs the same seqNo)

Note: The standard demands that sequenceCounter is managed per comID/msgType at each publisher, but shall be the same for redundant telegrams (subnet/srcIP).

Parameters

in	*comId*	comID to look for
in	*msgType*	PD/MD type
in	*srcIpAddr*	Source IP address

Return values

return	the sequence number

5.36.2.6 trdp_initSockets()

```
void trdp_initSockets (
            TRDP_SOCKETS_T iface[ ],
            UINT8 noOfEntries )
```

Handle the socket pool: Initialize it.

Parameters

in	*iface*	pointer to the socket pool
in	*noOfEntries*	entries in the socket pool

5.36.2.7 trdp_isAddressed()

```
BOOL8 trdp_isAddressed (
            const TRDP_URI_USER_T listUri,
            const TRDP_URI_USER_T destUri )
```

Check if listener URI is in addressing range of destination URI.

Parameters

in	*listUri*	Null terminated listener URI string to compare
in	*destUri*	Null terminated destination URI string to compare

Return values

FALSE	- not in addressing range
TRUE	- listener URI is in addressing range of destination URI

5.36.2.8 trdp_isInIPrange()

```
BOOL8 trdp_isInIPrange (
            TRDP_IP_ADDR_T receivedSrcIP,
            TRDP_IP_ADDR_T listenedSourceIPlow,
            TRDP_IP_ADDR_T listenedSourceIPhigh )
```

Check if received IP is in addressing range of listener's IPs.

Parameters

in	*receivedSrcIP*	Received IP address
in	*listenedSourceIPlow*	Lower bound IP
in	*listenedSourceIPhigh*	Upper bound IP

Return values

FALSE	- not in addressing range
TRUE	- received IP is in addressing range of listener

5.36.2.9 trdp_packetSizeMD()

```
UINT32 trdp_packetSizeMD (
            UINT32 dataSize )
```

Get the packet size from the raw data size.

Parameters

in	*dataSize*	net data size (without padding)

Return values

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

5.36.2.10 trdp_packetSizePD()

```
UINT32 trdp_packetSizePD (
            UINT32 dataSize )
```

Get the packet size from the raw data size.

Parameters

in	*dataSize*	net data size (without padding)

Return values

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

5.36.2.11 trdp_queueAppLast()

```
void trdp_queueAppLast (
            PD_ELE_T ** ppHead,
            PD_ELE_T * pNew )
```

Append an element at end of queue.

Parameters

in	*ppHead*	pointer to pointer to head of queue
in	*pNew*	pointer to element to append

5.36.2.12 trdp_queueDelElement()

```
void trdp_queueDelElement (
            PD_ELE_T ** ppHead,
            PD_ELE_T * pDelete )
```

Delete an element.

Parameters

in	*ppHead*	pointer to pointer to head of queue
in	*pDelete*	pointer to element to delete

5.36.2.13 trdp_queueFindComId()

```
PD_ELE_T* trdp_queueFindComId (
            PD_ELE_T * pHead,
            UINT32 comId )
```

Return the element with same comId.

Parameters

in	*pHead*	pointer to head of queue
in	*comId*	ComID to search for

Return values

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

5.36.2.14 trdp_queueFindExistingSub()

```
PD_ELE_T* trdp_queueFindExistingSub (
            PD_ELE_T * pHead,
            TRDP_ADDRESSES_T * addr )
```

Return the element with same comId and IP addresses.

Parameters

in	*pHead*	pointer to head of queue
in	*addr*	Pub/Sub handle (Address, ComID, srcIP & dest IP) to search for

Return values

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

5.36.2.15 trdp_queueFindPubAddr()

```
PD_ELE_T* trdp_queueFindPubAddr (
            PD_ELE_T * pHead,
            TRDP_ADDRESSES_T * addr )
```

Return the element with same comId, serviceId and IP addresses.

Parameters

in	*pHead*	pointer to head of queue
in	*addr*	Pub/Sub handle (Address, ComID, srcIP & dest IP, serviceId) to search for

Return values

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

5.36.2.16 trdp_queueFindSubAddr()

```
PD_ELE_T* trdp_queueFindSubAddr (
            PD_ELE_T * pHead,
            TRDP_ADDRESSES_T * addr )
```

Return the element with same comId and IP addresses.

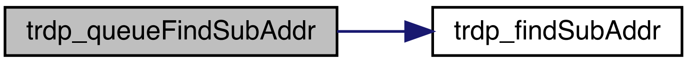
Parameters

in	*pHead*	pointer to head of queue
in	*addr*	Pub/Sub handle (Address, ComID, srcIP & dest IP, serviceId) to search for

Return values

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

Here is the call graph for this function:



5.36.2.17 trdp_queueInsFirst()

```
void trdp_queueInsFirst (
            PD_ELE_T ** ppHead,
            PD_ELE_T * pNew )
```

Insert an element at front of queue.

Parameters

in	*ppHead*	pointer to pointer to head of queue
in	*pNew*	pointer to element to insert

5.36.2.18 trdp_releaseSocket()

```
void trdp_releaseSocket (
            TRDP_SOCKETS_T iface[ ],
            INT32 lIndex,
            UINT32 connectTimeout,
            BOOL8 checkAll,
            TRDP_IP_ADDR_T mcGroupUsed )
```

Handle the socket pool: if a received TCP socket is unused, the socket connection timeout is started.

In Udp, Release a socket from our socket pool

Parameters

in,out	*iface*	socket pool
in	*lIndex*	index of socket to release
in	*connectTimeout*	time out
in	*checkAll*	release all TCP pending sockets
in	*mcGroupUsed*	release MC group subscription

5.36.2.19 trdp_requestSocket()

```
TRDP_ERR_T trdp_requestSocket (
            TRDP_SOCKETS_T iface[ ],
            UINT16 port,
            const TRDP_SEND_PARAM_T * params,
            TRDP_IP_ADDR_T srcIP,
            TRDP_IP_ADDR_T mcGroup,
            TRDP_SOCK_TYPE_T type,
            TRDP_OPTION_T options,
            BOOL8 rcvMostly,
            SOCKET useSocket,
            INT32 * pIndex,
            TRDP_IP_ADDR_T cornerIp )
```

Handle the socket pool: Request a socket from our socket pool First we loop through the socket pool and check if there is already a socket which would suit us.

If a multicast group should be joined, we do that on an otherwise suitable socket - up to 20 multicast goups can be joined per socket. If a socket for multicast publishing is requested, we also use the source IP to determine the interface for outgoing multicast traffic.

Parameters

in,out	*iface*	socket pool
in	*port*	port to use
in	*params*	parameters to use
in	*srcIP*	IP to bind to (0 = any address)
in	*mcGroup*	MC group to join (0 = do not join)
in	*type*	type determines port to bind to (PD, MD/UDP, MD/TCP)
in	*options*	blocking/nonblocking
in	*rcvMostly*	primarily used for receiving (tbd: bind on sender, too?)
out	*useSocket*	socket to use, do not open a new one
out	*pIndex*	returned index of socket pool
in	*cornerIp*	only used for receiving

Return values

TRDP_NO_ERR	
TRDP_PARAM_ERR	

5.36.2.20 trdp_resetSequenceCounter()

```
void trdp_resetSequenceCounter (
            PD_ELE_T * pElement,
            TRDP_IP_ADDR_T srcIP,
            TRDP_MSG_T msgType )
```

remove the sequence counter for the comID/source IP.

The sequence counter should be reset if there was a packet time out.

Parameters

in	*pElement*	subscription element
in	*srcIP*	Source IP address
in	*msgType*	message type

Return values

none	

5.36.2.21 trdp_SockAddJoin()

```
BOOL8 trdp_SockAddJoin (
            TRDP_IP_ADDR_T mcList[VOS_MAX_MULTICAST_CNT],
            TRDP_IP_ADDR_T mcGroup )
```

Add mc group to the list.

Parameters

in	*mcList*	List of multicast groups
in	*mcGroup*	multicast group

Return values

1	if added 0 if list is full

5.36.2.22 trdp_SockDelJoin()

```
BOOL8 trdp_SockDelJoin (
            TRDP_IP_ADDR_T mcList[VOS_MAX_MULTICAST_CNT],
            TRDP_IP_ADDR_T mcGroup )
```

remove mc group from the list

Parameters

in	*mcList*	List of multicast groups
in	*mcGroup*	multicast group

Return values

1	if deleted 0 was not in list

5.36.2.23 trdp_SockIsJoined()

```
BOOL8 trdp_SockIsJoined (
            const TRDP_IP_ADDR_T mcList[VOS_MAX_MULTICAST_CNT],
            TRDP_IP_ADDR_T mcGroup )
```

Check if a mc group is in the list.

Parameters

in	*mcList*	List of multicast groups
in	*mcGroup*	multicast group

Return values

1	if found 0 if not found

5.36.2.24 trdp_validTopoCounters()

```
BOOL8 trdp_validTopoCounters (
            UINT32 etbTopoCnt,
            UINT32 opTrnTopoCnt,
            UINT32 etbTopoCntFilter,
            UINT32 opTrnTopoCntFilter )
```

Check topography counters The applied conformance pattern follows Table A.5/A.21 (positive match): Telegram to be sent Locally stored value (appSession) Case etbTopoCnt opTrnTopoCnt etbTopoCntFilter opTrnTopoCntFilter 1 any any 0 0 2 any equal 0 equal 3 equal any equal 0 4 equal equal equal equal.

Parameters

in	*etbTopoCnt*	ETB topography counter to be checked
in	*opTrnTopoCnt*	Operational topography counter to be checked
in	*etbTopoCntFilter*	ETB topography counter filter value
in	*opTrnTopoCntFilter*	Operational topography counter filter value

Return values

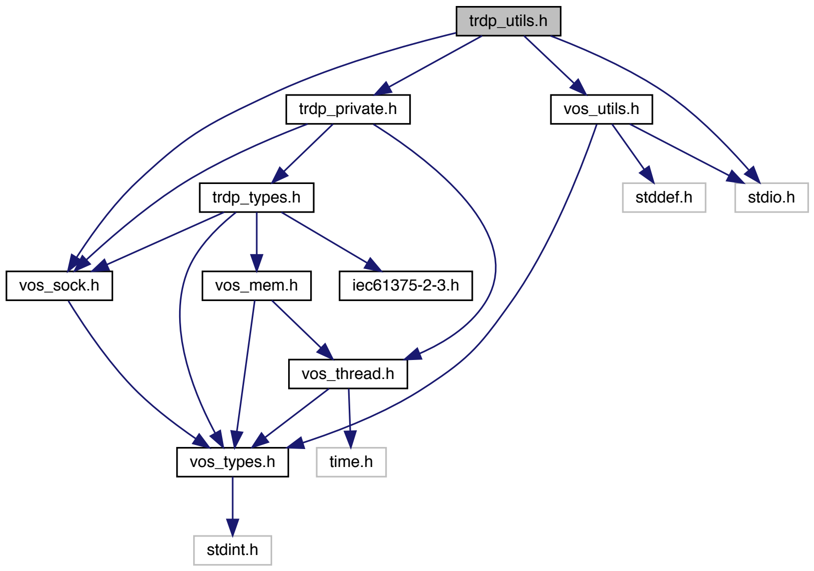
TRUE	Filter criteria matched FALSE Filter criteria not matched

5.37 trdp_utils.h File Reference

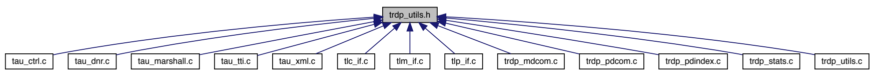
Common utilities for TRDP communication.

```
#include <stdio.h>
#include "trdp_private.h"
#include "vos_utils.h"
#include "vos_sock.h"
```

Include dependency graph for trdp_utils.h:



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



Functions

- void printSocketUsage (TRDP_SOCKETS_T iface[ ])

    Debug socket usage output.
- BOOL8 trdp_SockIsJoined (const TRDP_IP_ADDR_T mcList[VOS_MAX_MULTICAST_CNT], TRDP_IP_ADDR_T mcGroup)

    Check if a mc group is in the list.
- BOOL8 trdp_SockAddJoin (TRDP_IP_ADDR_T mcList[VOS_MAX_MULTICAST_CNT], TRDP_IP_ADDR_T mcGroup)

    Add mc group to the list.
- BOOL8 trdp_SockDelJoin (TRDP_IP_ADDR_T mcList[VOS_MAX_MULTICAST_CNT], TRDP_IP_ADDR_T mcGroup)

    remove mc group from the list
- PD_ELE_T ∗ trdp_queueFindComId (PD_ELE_T ∗pHead, UINT32 comId)

    Return the element with same comId.
- PD_ELE_T ∗ trdp_findSubAddr (PD_ELE_T ∗pHead, TRDP_ADDRESSES_T ∗pAddr, UINT32 comId)

    Return the element with same comId and IP addresses.
- PD_ELE_T ∗ trdp_queueFindSubAddr (PD_ELE_T ∗pHead, TRDP_ADDRESSES_T ∗pAddr)

    Return the element with same comId and IP addresses.
- PD_ELE_T ∗ trdp_queueFindExistingSub (PD_ELE_T ∗pHead, TRDP_ADDRESSES_T ∗pAddr)

Return the element with same comId and IP addresses.

- PD_ELE_T ∗ trdp_queueFindPubAddr (PD_ELE_T ∗pHead, TRDP_ADDRESSES_T ∗addr)

    Return the element with same comId, serviceId and IP addresses.
- void trdp_queueDelElement (PD_ELE_T ∗∗pHead, PD_ELE_T ∗pDelete)

    Delete an element.
- void trdp_queueAppLast (PD_ELE_T ∗∗pHead, PD_ELE_T ∗pNew)

    Append an element at end of queue.
- void trdp_queueInsFirst (PD_ELE_T ∗∗pHead, PD_ELE_T ∗pNew)

    Insert an element at front of queue.
- void trdp_initSockets (TRDP_SOCKETS_T iface[ ], UINT8 noOfEntries)

    Handle the socket pool: Initialize it.
- void trdp_resetSequenceCounter (PD_ELE_T ∗pElement, TRDP_IP_ADDR_T srcIP, TRDP_MSG_T msg←Type)

    remove the sequence counter for the comID/source IP.
- TRDP_IP_ADDR_T trdp_findMCjoins (TRDP_APP_SESSION_T appHandle, TRDP_IP_ADDR_T mcGroup)

    Check an MC group not used by other sockets / subscribers/ listeners.
- TRDP_ERR_T trdp_requestSocket (TRDP_SOCKETS_T iface[ ], UINT16 port, const TRDP_SEND_PARAM_T ∗params, TRDP_IP_ADDR_T srcIP, TRDP_IP_ADDR_T mcGroup, TRDP_SOCK_TYPE_T type, TRDP_←OPTION_T options, BOOL8 rcvMostly, SOCKET useSocket, INT32 ∗pIndex, TRDP_IP_ADDR_T cornerIp)

    Handle the socket pool: Request a socket from our socket pool First we loop through the socket pool and check if there is already a socket which would suit us.
- void trdp_releaseSocket (TRDP_SOCKETS_T iface[ ], INT32 lIndex, UINT32 connectTimeout, BOOL8 checkAll, TRDP_IP_ADDR_T mcGroupUsed)

    Handle the socket pool: if a received TCP socket is unused, the socket connection timeout is started.
- UINT32 trdp_packetSizePD (UINT32 dataSize)

    Get the packet size from the raw data size.
- UINT32 trdp_packetSizeMD (UINT32 dataSize)

    Get the packet size from the raw data size.
- UINT32 trdp_getSeqCnt (UINT32 comId, TRDP_MSG_T msgType, TRDP_IP_ADDR_T srcIpAddr)

    Get the initial sequence counter for the comID/message type and subnet (source IP).
- int trdp_checkSequenceCounter (PD_ELE_T ∗pElement, UINT32 sequenceCounter, TRDP_IP_ADDR_T srcIP, TRDP_MSG_T msgType)

    check and update the sequence counter for the comID/source IP.
- BOOL8 trdp_isAddressed (const TRDP_URI_USER_T listUri, const TRDP_URI_USER_T destUri)

    Check if listener URI is in addressing range of destination URI.
- BOOL8 trdp_validTopoCounters (UINT32 etbTopoCnt, UINT32 opTrnTopoCnt, UINT32 etbTopoCntFilter, U←INT32 opTrnTopoCntFilter)

    Check topography counters The applied conformance pattern follows Table A.5/A.21 (positive match): Telegram to be sent Locally stored value (appSession) Case etbTopoCnt opTrnTopoCnt etbTopoCntFilter opTrnTopoCntFilter 1 any any 0 0 2 any equal 0 equal 3 equal any equal 0 4 equal equal equal equal.
- BOOL8 trdp_isInIPrange (TRDP_IP_ADDR_T receivedSrcIP, TRDP_IP_ADDR_T listenedSourceIPlow, TRDP_IP_ADDR_T listenedSourceIPhigh)

    Check if received IP is in addressing range of listener's IPs.

5.37.1 Detailed Description

Common utilities for TRDP communication.

Note

Project: TCNOpen TRDP prototype stack

Author

Bernd Loehr, NewTec GmbH

Remarks

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5.37.2 Function Documentation

5.37.2.1 printSocketUsage()

```
void printSocketUsage (
            TRDP_SOCKETS_T iface[ ] )
```

Debug socket usage output.

Parameters

in	*iface*	List of sockets

5.37.2.2 trdp_checkSequenceCounter()

```
int trdp_checkSequenceCounter (
            PD_ELE_T * pElement,
            UINT32 sequenceCounter,
            TRDP_IP_ADDR_T srcIP,
            TRDP_MSG_T msgType )
```

check and update the sequence counter for the comID/source IP.

If the comID/srcIP is not found, update it and return 0 - else if already received, return 1 On memory error, return -1

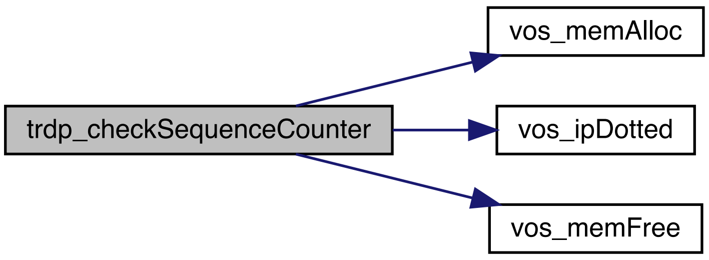
Parameters

in	*pElement*	subscription element
in	*sequenceCounter*	sequence counter to check
in	*srcIP*	Source IP address
in	*msgType*	type of the message

Return values

0	- no duplicate 1 - duplicate or old sequence counter -1 - memory error

Here is the call graph for this function:



5.37.2.3 trdp_findMCjoins()

```
TRDP_IP_ADDR_T trdp_findMCjoins (
            TRDP_APP_SESSION_T appHandle,
            TRDP_IP_ADDR_T mcGroup )
```

Check an MC group not used by other sockets / subscribers/ listeners.

Parameters

in	*appHandle*	the handle returned by tlc_openSession
in	*mcGroup*	multicast group to look for

Return values

multi	cast group if unused VOS_INADDR_ANY if used

5.37.2.4 trdp_findSubAddr()

```
PD_ELE_T* trdp_findSubAddr (
            PD_ELE_T * pHead,
            TRDP_ADDRESSES_T * addr,
            UINT32 comId )
```

Return the element with same comId and IP addresses.

Parameters

in	*pHead*	pointer to head of queue
in	*addr*	Pub/Sub handle (Address, ComID, srcIP & dest IP, serviceId) to search for
in	*comId*	ComId to stay on on a sorted search, 0 when searching on unsorted queues

Return values

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

5.37.2.5 trdp_getSeqCnt()

```
UINT32 trdp_getSeqCnt (
             UINT32 comId,
             TRDP_MSG_T msgType,
             TRDP_IP_ADDR_T srcIpAddr )
```

Get the initial sequence counter for the comID/message type and subnet (source IP).

If the comID/srcIP is not found elsewhere, return 0 - else return its current sequence number (the redundant packet needs the same seqNo)

Note: The standard demands that sequenceCounter is managed per comID/msgType at each publisher, but shall be the same for redundant telegrams (subnet/srcIP).

Parameters

in	*comId*	comID to look for
in	*msgType*	PD/MD type
in	*srcIpAddr*	Source IP address

Return values

return	the sequence number

5.37.2.6 trdp_initSockets()

```
void trdp_initSockets (
             TRDP_SOCKETS_T iface[ ],
             UINT8 noOfEntries )
```

Handle the socket pool: Initialize it.

Parameters

in	*iface*	pointer to the socket pool
in	*noOfEntries*	entries in the socket pool

5.37.2.7 trdp_isAddressed()

```
BOOL8 trdp_isAddressed (
            const TRDP_URI_USER_T listUri,
            const TRDP_URI_USER_T destUri )
```

Check if listener URI is in addressing range of destination URI.

Parameters

in	*listUri*	Null terminated listener URI string to compare
in	*destUri*	Null terminated destination URI string to compare

Return values

FALSE	- not in addressing range
TRUE	- listener URI is in addressing range of destination URI

5.37.2.8 trdp_isInIPrange()

```
BOOL8 trdp_isInIPrange (
            TRDP_IP_ADDR_T receivedSrcIP,
            TRDP_IP_ADDR_T listenedSourceIPlow,
            TRDP_IP_ADDR_T listenedSourceIPhigh )
```

Check if received IP is in addressing range of listener's IPs.

Parameters

in	*receivedSrcIP*	Received IP address
in	*listenedSourceIPlow*	Lower bound IP
in	*listenedSourceIPhigh*	Upper bound IP

Return values

FALSE	- not in addressing range
TRUE	- received IP is in addressing range of listener

5.37.2.9 trdp_packetSizeMD()

```
UINT32 trdp_packetSizeMD (
            UINT32 dataSize )
```

Get the packet size from the raw data size.

Parameters

in	*dataSize*	net data size (without padding)

Return values

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

5.37.2.10 trdp_packetSizePD()

```
UINT32 trdp_packetSizePD (
            UINT32 dataSize )
```

Get the packet size from the raw data size.

Parameters

in	*dataSize*	net data size (without padding)

Return values

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

5.37.2.11 trdp_queueAppLast()

```
void trdp_queueAppLast (
            PD_ELE_T ** ppHead,
            PD_ELE_T * pNew )
```

Append an element at end of queue.

Parameters

in	*ppHead*	pointer to pointer to head of queue
in	*pNew*	pointer to element to append

5.37.2.12 trdp_queueDelElement()

```
void trdp_queueDelElement (
            PD_ELE_T ** ppHead,
            PD_ELE_T * pDelete )
```

Delete an element.

Parameters

in	*ppHead*	pointer to pointer to head of queue
in	*pDelete*	pointer to element to delete

5.37.2.13 trdp_queueFindComId()

```
PD_ELE_T* trdp_queueFindComId (
            PD_ELE_T * pHead,
            UINT32 comId )
```

Return the element with same comId.

Parameters

in	*pHead*	pointer to head of queue
in	*comId*	ComID to search for

Return values

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

5.37.2.14 trdp_queueFindExistingSub()

```
PD_ELE_T* trdp_queueFindExistingSub (
            PD_ELE_T * pHead,
            TRDP_ADDRESSES_T * addr )
```

Return the element with same comId and IP addresses.

Parameters

in	*pHead*	pointer to head of queue
in	*addr*	Pub/Sub handle (Address, ComID, srcIP & dest IP) to search for

Return values

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

5.37.2.15 trdp_queueFindPubAddr()

```
PD_ELE_T* trdp_queueFindPubAddr (
            PD_ELE_T * pHead,
            TRDP_ADDRESSES_T * addr )
```

Return the element with same comId, serviceId and IP addresses.

Parameters

in	*pHead*	pointer to head of queue
in	*addr*	Pub/Sub handle (Address, ComID, srcIP & dest IP, serviceId) to search for

Return values

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

5.37.2.16 trdp_queueFindSubAddr()

```
PD_ELE_T* trdp_queueFindSubAddr (
            PD_ELE_T * pHead,
            TRDP_ADDRESSES_T * addr )
```

Return the element with same comId and IP addresses.

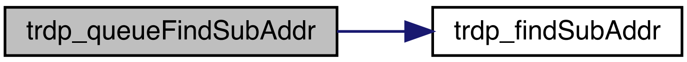
Parameters

in	*pHead*	pointer to head of queue
in	*addr*	Pub/Sub handle (Address, ComID, srcIP & dest IP, serviceId) to search for

Return values

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

Here is the call graph for this function:



5.37.2.17 trdp_queueInsFirst()

```
void trdp_queueInsFirst (
            PD_ELE_T ** ppHead,
            PD_ELE_T * pNew )
```

Insert an element at front of queue.

Parameters

in	*ppHead*	pointer to pointer to head of queue
in	*pNew*	pointer to element to insert

5.37.2.18 trdp_releaseSocket()

```
void trdp_releaseSocket (
            TRDP_SOCKETS_T iface[ ],
            INT32 lIndex,
            UINT32 connectTimeout,
            BOOL8 checkAll,
            TRDP_IP_ADDR_T mcGroupUsed )
```

Handle the socket pool: if a received TCP socket is unused, the socket connection timeout is started.

In Udp, Release a socket from our socket pool

Parameters

in,out	*iface*	socket pool
in	*lIndex*	index of socket to release
in	*connectTimeout*	time out
in	*checkAll*	release all TCP pending sockets
in	*mcGroupUsed*	release MC group subscription

5.37.2.19 trdp_requestSocket()

```
TRDP_ERR_T trdp_requestSocket (
            TRDP_SOCKETS_T iface[ ],
            UINT16 port,
            const TRDP_SEND_PARAM_T * params,
            TRDP_IP_ADDR_T srcIP,
            TRDP_IP_ADDR_T mcGroup,
            TRDP_SOCK_TYPE_T type,
            TRDP_OPTION_T options,
            BOOL8 rcvMostly,
            SOCKET useSocket,
            INT32 * pIndex,
            TRDP_IP_ADDR_T cornerIp )
```

Handle the socket pool: Request a socket from our socket pool First we loop through the socket pool and check if there is already a socket which would suit us.

If a multicast group should be joined, we do that on an otherwise suitable socket - up to 20 multicast goups can be joined per socket. If a socket for multicast publishing is requested, we also use the source IP to determine the interface for outgoing multicast traffic.

Parameters

in,out	*iface*	socket pool
in	*port*	port to use
in	*params*	parameters to use
in	*srcIP*	IP to bind to (0 = any address)
in	*mcGroup*	MC group to join (0 = do not join)
in	*type*	type determines port to bind to (PD, MD/UDP, MD/TCP)
in	*options*	blocking/nonblocking
in	*rcvMostly*	primarily used for receiving (tbd: bind on sender, too?)
out	*useSocket*	socket to use, do not open a new one
out	*pIndex*	returned index of socket pool
in	*cornerIp*	only used for receiving

Return values

TRDP_NO_ERR	
TRDP_PARAM_ERR	

5.37.2.20 trdp_resetSequenceCounter()

```
void trdp_resetSequenceCounter (
            PD_ELE_T * pElement,
            TRDP_IP_ADDR_T srcIP,
            TRDP_MSG_T msgType )
```

remove the sequence counter for the comID/source IP.

The sequence counter should be reset if there was a packet time out.

Parameters

in	*pElement*	subscription element
in	*srcIP*	Source IP address
in	*msgType*	message type

Return values

none	

5.37.2.21 trdp_SockAddJoin()

```
BOOL8 trdp_SockAddJoin (
            TRDP_IP_ADDR_T mcList[VOS_MAX_MULTICAST_CNT],
            TRDP_IP_ADDR_T mcGroup )
```

Add mc group to the list.

Parameters

in	*mcList*	List of multicast groups
in	*mcGroup*	multicast group

Return values

1	if added 0 if list is full

5.37.2.22 trdp_SockDelJoin()

```
BOOL8 trdp_SockDelJoin (
            TRDP_IP_ADDR_T mcList[VOS_MAX_MULTICAST_CNT],
            TRDP_IP_ADDR_T mcGroup )
```

remove mc group from the list

Parameters

in	*mcList*	List of multicast groups
in	*mcGroup*	multicast group

Return values

1	if deleted 0 was not in list

5.37.2.23 trdp_SockIsJoined()

```
BOOL8 trdp_SockIsJoined (
            const TRDP_IP_ADDR_T mcList[VOS_MAX_MULTICAST_CNT],
            TRDP_IP_ADDR_T mcGroup )
```

Check if a mc group is in the list.

Parameters

in	*mcList*	List of multicast groups
in	*mcGroup*	multicast group

Return values

1	if found 0 if not found

5.37.2.24 trdp_validTopoCounters()

```
BOOL8 trdp_validTopoCounters (
            UINT32 etbTopoCnt,
            UINT32 opTrnTopoCnt,
            UINT32 etbTopoCntFilter,
            UINT32 opTrnTopoCntFilter )
```

Check topography counters The applied conformance pattern follows Table A.5/A.21 (positive match): Telegram to be sent Locally stored value (appSession) Case etbTopoCnt opTrnTopoCnt etbTopoCntFilter opTrnTopoCntFilter 1 any any 0 0 2 any equal 0 equal 3 equal any equal 0 4 equal equal equal equal.

Parameters

in	*etbTopoCnt*	ETB topography counter to be checked
in	*opTrnTopoCnt*	Operational topography counter to be checked
in	*etbTopoCntFilter*	ETB topography counter filter value
in	*opTrnTopoCntFilter*	Operational topography counter filter value

Return values

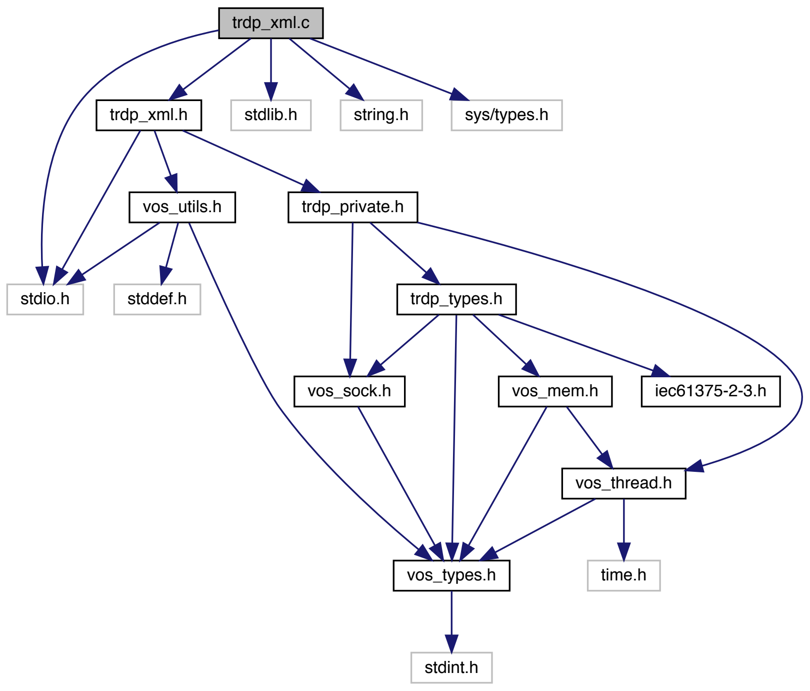
TRUE	Filter criteria matched FALSE Filter criteria not matched

5.38 trdp_xml.c File Reference

Simple XML parser.

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <sys/types.h>
#include "trdp_xml.h"
```

Include dependency graph for trdp_xml.c:



Functions

- TRDP_ERR_T trdp_XMLOpen (XML_HANDLE_T ∗pXML, const char ∗file)

  Opens the XML parsing.
- TRDP_ERR_T trdp_XMLMemOpen (XML_HANDLE_T ∗pXML, char ∗pBuffer, size_t bufSize)

  Opens the XML parsing from a buffer (string stream).
- void trdp_XMLRewind (XML_HANDLE_T ∗pXML)

  Rewind to start.
- void trdp_XMLClose (XML_HANDLE_T ∗pXML)

  Closes the XML parsng.
- int trdp_XMLSeekStartTagAny (XML_HANDLE_T ∗pXML, char ∗tag, int maxlen)

  Seek next tag on starting depth and return it in provided buffer.
- int trdp_XMLSeekStartTag (XML_HANDLE_T ∗pXML, const char ∗tag)

  Seek a specific tag.
- int trdp_XMLCountStartTag (XML_HANDLE_T ∗pXML, const char ∗tag)

  Count a specific tag.
- void trdp_XMLEnter (XML_HANDLE_T ∗pXML)

  Enter level in XML file.
- void trdp_XMLLeave (XML_HANDLE_T ∗pXML)

  Leave level in XML file.
- XML_TOKEN_T trdp_XMLGetAttribute (XML_HANDLE_T ∗pXML, CHAR8 ∗attribute, UINT32 ∗pValueInt, CHAR8 ∗value)

  Get value of next attribute, as string and if possible as integer.

5.38.1 Detailed Description

Simple XML parser.

Hint: Missing optional elements must be handled using the count-function, otherwise following elements will be following ignored!

Note

Project: TCNOpen TRDP prototype stack

Author

Bernd Loehr, NewTec GmbH; based on code by Peter Brander, Bombardier

Remarks

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5.38.2 Function Documentation

5.38.2.1 trdp_XMLClose()

```
void trdp_XMLClose (
             XML_HANDLE_T * pXML )
```

Closes the XML parsng.

Parameters

in	*pXML*	Pointer to local data

Return values

none	

5.38.2.2 trdp_XMLCountStartTag()

```
int trdp_XMLCountStartTag (
             XML_HANDLE_T * pXML,
             const char * tag )
```

Count a specific tag.

Parameters

in	*pXML*	Pointer to local data
in	*tag*	Tag to count

Return values

0	if found !=0 if not found

5.38.2.3 trdp_XMLEnter()

```
void trdp_XMLEnter (
             XML_HANDLE_T * pXML )
```

Enter level in XML file.

Parameters

in	*pXML*	Pointer to local data

Return values

none	

5.38.2.4 trdp_XMLGetAttribute()

```
XML_TOKEN_T trdp_XMLGetAttribute (
             XML_HANDLE_T * pXML,
             CHAR8 * attribute,
             UINT32 * pValueInt,
             CHAR8 * value )
```

Get value of next attribute, as string and if possible as integer.

Parameters

in	*pXML*	Pointer to local data
in	*attribute*	Pointer to attribute
out	*pValueInt*	Pointer to resulting integer value
out	*value*	Pointer to resulting string value

Return values

TOK_ATTRIBUTE	if found token if not found

5.38.2.5 trdp_XMLLeave()

```
void trdp_XMLLeave (
             XML_HANDLE_T * pXML )
```

Leave level in XML file.

Parameters

in	*pXML*	Pointer to local data

Return values

none	

5.38.2.6 trdp_XMLMemOpen()

```
TRDP_ERR_T trdp_XMLMemOpen (
             XML_HANDLE_T * pXML,
             char * pBuffer,
             size_t bufSize )
```

Opens the XML parsing from a buffer (string stream).

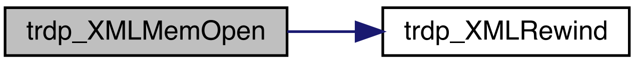
Parameters

in	*pXML*	Pointer to local data
in	*pBuffer*	Pointer to XML stream buffer
in	*bufSize*	Size of XML stream buffer

Return values

TRDP_IO_ERR	

Here is the call graph for this function:



5.38.2.7 trdp_XMLOpen()

```
TRDP_ERR_T trdp_XMLOpen (
             XML_HANDLE_T * pXML,
             const char * file )
```

Opens the XML parsing.

Parameters

in	*pXML*	Pointer to local data
in	*file*	Pathname of XML file

Return values

none	

5.38.2.8 trdp_XMLRewind()

```
void trdp_XMLRewind (
             XML_HANDLE_T * pXML )
```

Rewind to start.

Parameters

in	*pXML*	Pointer to local data

Return values

none	

5.38.2.9 trdp_XMLSeekStartTag()

```
int trdp_XMLSeekStartTag (
             XML_HANDLE_T * pXML,
             const char * tag )
```

Seek a specific tag.

Parameters

in	*pXML*	Pointer to local data
in	*tag*	Tag to be found

Return values

0	if found !=0 if not found

5.38.2.10 trdp_XMLSeekStartTagAny()

```
int trdp_XMLSeekStartTagAny (
            XML_HANDLE_T * pXML,
            char * tag,
            int maxlen )
```

Seek next tag on starting depth and return it in provided buffer.

Start tags on deeper depths are ignored.

Parameters

in	*pXML*	Pointer to local data
in,out	*tag*	Buffer for found tag
in	*maxlen*	Length of buffer

Return values

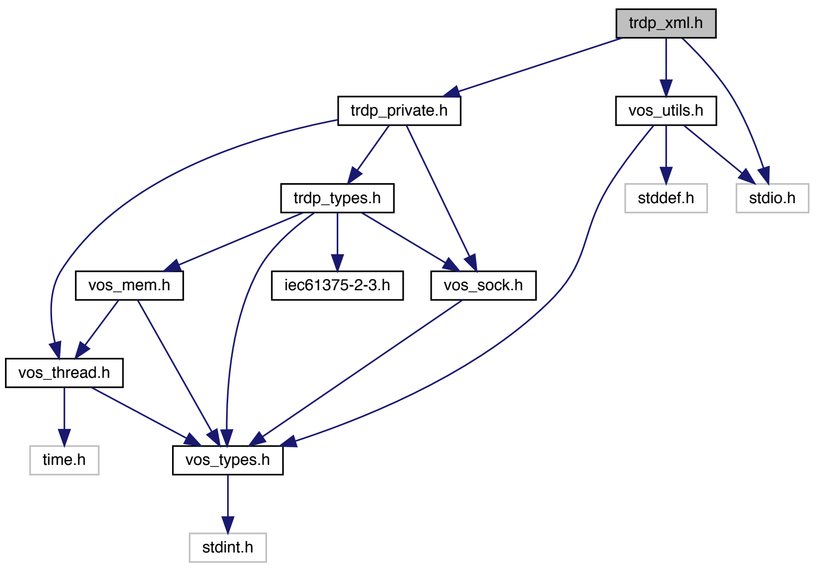
0	if found !=0 if not found

5.39 trdp_xml.h File Reference

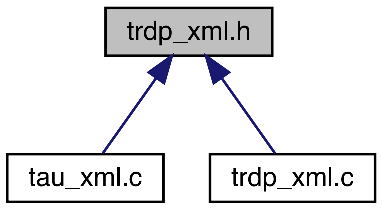
Simple XML parser.

```
#include <stdio.h>
#include "trdp_private.h"
#include "vos_utils.h"
```

Include dependency graph for trdp_xml.h:



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



Functions

- TRDP_ERR_T trdp_XMLOpen (XML_HANDLE_T ∗pXML, const char ∗file)

  Opens the XML parsing.
- TRDP_ERR_T trdp_XMLMemOpen (XML_HANDLE_T ∗pXML, char ∗pBuffer, size_t bufSize)

  Opens the XML parsing from a buffer (string stream).
- void trdp_XMLClose (XML_HANDLE_T ∗pXML)

  Closes the XML parsng.
- int trdp_XMLCountStartTag (XML_HANDLE_T ∗pXML, const char ∗tag)

  Count a specific tag.
- int trdp_XMLSeekStartTagAny (XML_HANDLE_T ∗pXML, char ∗tag, int maxlen)

  Seek next tag on starting depth and return it in provided buffer.

- int trdp_XMLSeekStartTag (XML_HANDLE_T ∗pXML, const char ∗tag)

  Seek a specific tag.
- XML_TOKEN_T trdp_XMLGetAttribute (XML_HANDLE_T ∗pXML, CHAR8 ∗attribute, UINT32 ∗pValueInt, CHAR8 ∗value)

  Get value of next attribute, as string and if possible as integer.
- void trdp_XMLRewind (XML_HANDLE_T ∗pXML)

  Rewind to start.
- void trdp_XMLEnter (XML_HANDLE_T ∗pXML)

  Enter level in XML file.
- void trdp_XMLLeave (XML_HANDLE_T ∗pXML)

  Leave level in XML file.

5.39.1 Detailed Description

Simple XML parser.

Note

Project: TCNOpen TRDP prototype stack

Author

Bernd Loehr, NewTec GmbH

Remarks

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5.39.2 Function Documentation

5.39.2.1 trdp_XMLClose()

```
void trdp_XMLClose (
             XML_HANDLE_T * pXML )
```

Closes the XML parsng.

Parameters

in	*pXML*	Pointer to local data

Return values

none	

5.39.2.2 trdp_XMLCountStartTag()

```
int trdp_XMLCountStartTag (
             XML_HANDLE_T * pXML,
             const char * tag )
```

Count a specific tag.

Parameters

in	*pXML*	Pointer to local data
in	*tag*	Tag to count

Return values

0	if found !=0 if not found

5.39.2.3 trdp_XMLEnter()

```
void trdp_XMLEnter (
             XML_HANDLE_T * pXML )
```

Enter level in XML file.

Parameters

in	*pXML*	Pointer to local data

Return values

none	

5.39.2.4 trdp_XMLGetAttribute()

```
XML_TOKEN_T trdp_XMLGetAttribute (
             XML_HANDLE_T * pXML,
             CHAR8 * attribute,
             UINT32 * pValueInt,
             CHAR8 * value )
```

Get value of next attribute, as string and if possible as integer.

Parameters

in	*pXML*	Pointer to local data
in	*attribute*	Pointer to attribute
out	*pValueInt*	Pointer to resulting integer value
out	*value*	Pointer to resulting string value

Return values

TOK_ATTRIBUTE	if found token if not found

5.39.2.5 trdp_XMLLeave()

```
void trdp_XMLLeave (
            XML_HANDLE_T * pXML )
```

Leave level in XML file.

Parameters

in	*pXML*	Pointer to local data

Return values

none	

5.39.2.6 trdp_XMLMemOpen()

```
TRDP_ERR_T trdp_XMLMemOpen (
            XML_HANDLE_T * pXML,
            char * pBuffer,
            size_t bufSize )
```

Opens the XML parsing from a buffer (string stream).

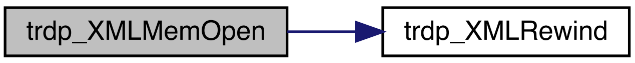
Parameters

in	*pXML*	Pointer to local data
in	*pBuffer*	Pointer to XML stream buffer
in	*bufSize*	Size of XML stream buffer

Return values

TRDP_IO_ERR	

Here is the call graph for this function:



5.39.2.7 trdp_XMLOpen()

```
TRDP_ERR_T trdp_XMLOpen (
             XML_HANDLE_T * pXML,
             const char * file )
```

Opens the XML parsing.

Parameters

in	*pXML*	Pointer to local data
in	*file*	Pathname of XML file

Return values

none	

5.39.2.8 trdp_XMLRewind()

```
void trdp_XMLRewind (
             XML_HANDLE_T * pXML )
```

Rewind to start.

Parameters

in	*pXML*	Pointer to local data

Return values

none	

5.39.2.9 trdp_XMLSeekStartTag()

```
int trdp_XMLSeekStartTag (
            XML_HANDLE_T * pXML,
            const char * tag )
```

Seek a specific tag.

Parameters

in	*pXML*	Pointer to local data
in	*tag*	Tag to be found

Return values

0	if found !=0 if not found

5.39.2.10 trdp_XMLSeekStartTagAny()

```
int trdp_XMLSeekStartTagAny (
            XML_HANDLE_T * pXML,
            char * tag,
            int maxlen )
```

Seek next tag on starting depth and return it in provided buffer.

Start tags on deeper depths are ignored.

Parameters

in	*pXML*	Pointer to local data
in,out	*tag*	Buffer for found tag
in	*maxlen*	Length of buffer

Return values

0	if found !=0 if not found

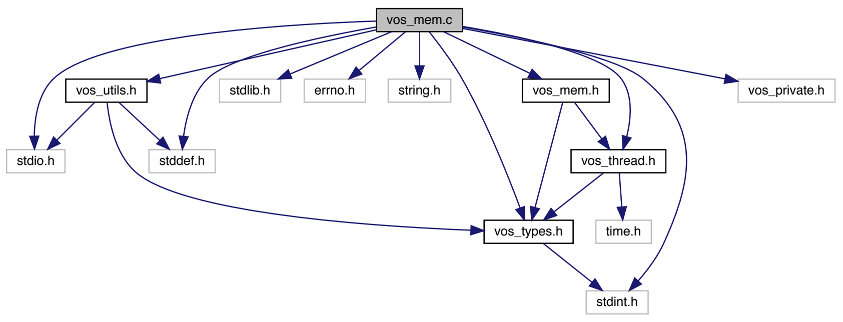
5.40 vos_mem.c File Reference

Memory functions.

```
#include <stdio.h>
#include <stddef.h>
#include <stdint.h>
#include <stdlib.h>
#include <errno.h>
```

```
#include <string.h>
#include "vos_types.h"
#include "vos_utils.h"
#include "vos_mem.h"
#include "vos_thread.h"
#include "vos_private.h"
```

Include dependency graph for vos_mem.c:



Functions

- EXT_DECL VOS_ERR_T vos_memInit (UINT8 ∗pMemoryArea, UINT32 size, const UINT32 frag↩ Mem[VOS_MEM_NBLOCKSIZES])

  Initialize the memory unit.
- EXT_DECL void 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 void 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 ∗pMinFree, UINT32 ∗pNumAllocBlocks, UINT32 ∗pNumAllocErr, UINT32 ∗pNumFreeErr, UINT32 block↩ Size[VOS_MEM_NBLOCKSIZES], UINT32 usedBlockSize[VOS_MEM_NBLOCKSIZES])

  Return used and available memory (of memory area above).
- EXT_DECL void vos_qsort (void ∗pBuf, UINT32 num, UINT32 size, int(∗compare)(const void ∗, const void ∗))

  Sort an array.
- EXT_DECL void ∗ vos_bsearch (const void ∗pKey, const void ∗pBuf, UINT32 num, UINT32 size, int(∗compare)(const void ∗, const void ∗))

  Binary search in a sorted array.
- EXT_DECL INT32 vos_strnicmp (const CHAR8 ∗pStr1, const CHAR8 ∗pStr2, UINT32 count)

  Case insensitive string compare.
- EXT_DECL void vos_strncpy (CHAR8 ∗pStrDst, const CHAR8 ∗pStrSrc, UINT32 count)

  String copy with length limitation.
- EXT_DECL void vos_strncat (CHAR8 ∗pStrDst, UINT32 count, const CHAR8 ∗pStrSrc)

  String concatenation with length limitation.
- EXT_DECL VOS_ERR_T vos_queueCreate (VOS_QUEUE_POLICY_T queueType, UINT32 maxNoOfMsg, VOS_QUEUE_T ∗pQueueHandle)

  Initialize a message queue.
- EXT_DECL VOS_ERR_T vos_queueSend (VOS_QUEUE_T queueHandle, UINT8 ∗pData, UINT32 size)

Send a message.

- EXT_DECL VOS_ERR_T vos_queueReceive (VOS_QUEUE_T queueHandle, UINT8 ∗∗ppData, UINT32 ∗pSize, UINT32 usTimeout)

  Get a message.
- EXT_DECL VOS_ERR_T vos_queueDestroy (VOS_QUEUE_T queueHandle)

  Destroy a message queue.

5.40.1 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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5.40.2 Function Documentation

5.40.2.1 vos_bsearch()

```
EXT_DECL void∗ vos_bsearch (
             const void ∗ pKey,
             const void ∗ pBuf,
             UINT32 num,
             UINT32 size,
             int(∗)(const void ∗, const void ∗) compare )
```

Binary search in a sorted array.

This is just a wrapper for the standard bsearch function.

Parameters

in	*pKey*	Key to search for
in	*pBuf*	Pointer to the array to search
in	*num*	number of elements
in	*size*	size of one element
in	*compare*	Pointer to compare function return -n if arg1 $<$ arg2, return 0 if arg1 == arg2, return +n if arg1 $>$ arg2 where n is an integer != 0

Return values

Pointer	to found element or NULL

5.40.2.2 vos_memAlloc()

```
EXT_DECL UINT8* vos_memAlloc (
             UINT32 size )
```

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

Parameters

in	*size*	Size of requested block

Return values

Pointer	to memory area
NULL	if no memory available

5.40.2.3 vos_memCount()

```
EXT_DECL VOS_ERR_T vos_memCount (
             UINT32 * pAllocatedMemory,
             UINT32 * pFreeMemory,
             UINT32 * pMinFree,
             UINT32 * pNumAllocBlocks,
             UINT32 * pNumAllocErr,
             UINT32 * pNumFreeErr,
             UINT32 blockSize[VOS_MEM_NBLOCKSIZES],
             UINT32 usedBlockSize[VOS_MEM_NBLOCKSIZES] )
```

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

Parameters

out	*pAllocatedMemory*	Pointer to allocated memory size
out	*pFreeMemory*	Pointer to free memory size
out	*pMinFree*	Pointer to minimal free memory size in statistics interval
out	*pNumAllocBlocks*	Pointer to number of allocated memory blocks
out	*pNumAllocErr*	Pointer to number of allocation errors
out	*pNumFreeErr*	Pointer to number of free errors
out	*blockSize*	Pointer to list of memory block sizes
out	*usedBlockSize*	Pointer to list of used memoryblocks

Return values

VOS_NO_ERR	no error
VOS_INIT_ERR	module not initialised

5.40.2.4 vos_memDelete()

```
EXT_DECL void 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

in	*pMemoryArea*	Pointer to memory area used

5.40.2.5 vos_memFree()

```
EXT_DECL void vos_memFree (
             void * pMemBlock )
```

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

Parameters

in	*pMemBlock*	Pointer to memory block to be freed

5.40.2.6 vos_memInit()

```
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_memAlloc and vos_memFree. The used block sizes can be supplied and will be preallocated. If half of the overall size of the requested memory area would be pre-allocated, either by the default pre-allocation table or a provided one, no pre-allocation takes place.

Parameters

in	*pMemoryArea*	Pointer to memory area to use
in	*size*	Size of provided memory area
in	*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
VOS_MUTEX_ERR	no mutex available

5.40.2.7 vos_qsort()

```
EXT_DECL void vos_qsort (
            void * pBuf,
            UINT32 num,
            UINT32 size,
            int(*)(const void *, const void *) compare )
```

Sort an array.

This is just a wrapper for the standard qsort function.

Parameters

in,out	*pBuf*	Pointer to the array to sort
in	*num*	number of elements
in	*size*	size of one element
in	*compare*	Pointer to compare function return -n if arg1 $<$ arg2, return 0 if arg1 == arg2, return +n if arg1 $>$ arg2 where n is an integer != 0

Return values

none	

5.40.2.8 vos_queueCreate()

```
EXT_DECL VOS_ERR_T vos_queueCreate (
            VOS_QUEUE_POLICY_T queueType,
            UINT32 maxNoOfMsg,
            VOS_QUEUE_T * pQueueHandle )
```

Initialize a message queue.

Returns a handle for further calls

Parameters

in	*queueType*	Define queue type (1 = FIFO, 2 = LIFO, 3 = PRIO)
in	*maxNoOfMsg*	Maximum number of messages
out	*pQueueHandle*	Handle of created queue

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

5.40.2.9 vos_queueDestroy()

```
EXT_DECL VOS_ERR_T vos_queueDestroy (
            VOS_QUEUE_T queueHandle )
```

Destroy a message queue.

Free all resources used by this queue

Parameters

in	*queueHandle*	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

5.40.2.10 vos_queueReceive()

```
EXT_DECL VOS_ERR_T vos_queueReceive (
            VOS_QUEUE_T queueHandle,
            UINT8 ** ppData,
            UINT32 * pSize,
            UINT32 usTimeout )
```

Get a message.

Parameters

in	*queueHandle*	Queue handle
out	*ppData*	Pointer to data pointer to be received
out	*pSize*	Size of receive data
in	*usTimeout*	Maximum time to wait for a message (in usec)

Return values

VOSNO_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

5.40.2.11 vos_queueSend()

```
EXT_DECL VOS_ERR_T vos_queueSend (
             VOS_QUEUE_T queueHandle,
             UINT8 * pData,
             UINT32 size )
```

Send a message.

Parameters

in	*queueHandle*	Queue handle
in	*pData*	Pointer to data to be sent
in	*size*	Size of data to be sent

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

5.40.2.12 vos_strncat()

```
EXT_DECL void vos_strncat (
             CHAR8 * pStrDst,
             UINT32 count,
             const CHAR8 * pStrSrc )
```

String concatenation with length limitation.

Parameters

`in`	*pStrDst*	Destination string
`in`	*count*	Size of destination buffer
`in`	*pStrSrc*	Null terminated string to append

Return values

none	

5.40.2.13 vos_strncpy()

```
EXT_DECL void vos_strncpy (
             CHAR8 * pStrDst,
             const CHAR8 * pStrSrc,
             UINT32 count )
```

String copy with length limitation.

Parameters

`in`	*pStrDst*	Destination string
`in`	*pStrSrc*	Null terminated string to copy
`in`	*count*	Maximum number of characters to copy

Return values

none	

5.40.2.14 vos_strnicmp()

```
EXT_DECL INT32 vos_strnicmp (
             const CHAR8 * pStr1,
             const CHAR8 * pStr2,
             UINT32 count )
```

Case insensitive string compare.

Parameters

`in`	*pStr1*	Null terminated string to compare
`in`	*pStr2*	Null terminated string to compare
`in`	*count*	Maximum number of characters to compare

Return values

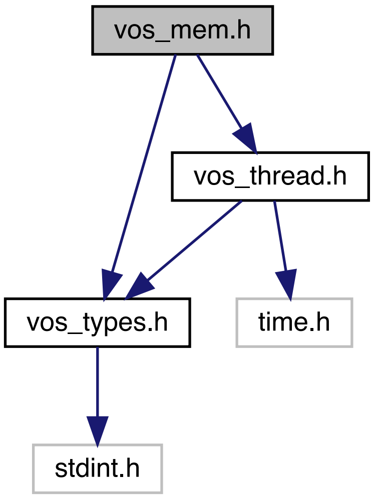
0	- equal
$<$*0*	- string1 less than string 2
$>$*0*	- string 1 greater than string 2

5.41 vos_mem.h File Reference

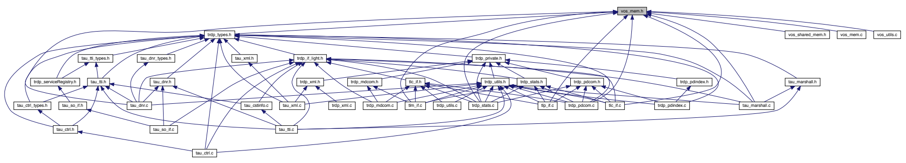
Memory and queue functions for OS abstraction.

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

Include dependency graph for vos_mem.h:



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



Macros

- #define VOS_MEM_MAX_PREALLOCATE 10u

  Max blocks to pre-allocate.

- #define VOS_MEM_NBLOCKSIZES 15u

    No of pre-defined block sizes.
- #define VOS_MEM_BLOCKSIZES

    We internally allocate memory always by these block sizes.
- #define VOS_MEM_PREALLOCATE {0u, 0u, 0u, 0u, 0u, 0u, 0u, 4u, 0u, 0u, 0u, 0u, 0u, 0u, 0u}

    Default pre-allocation of free memory blocks.

Typedefs

- typedef struct VOS_QUEUE ∗ VOS_QUEUE_T

    Opaque queue define.

Enumerations

- enum VOS_QUEUE_POLICY_T

    Queue policy matching pthread/Posix defines.

Functions

- EXT_DECL VOS_ERR_T vos_memInit (UINT8 ∗pMemoryArea, UINT32 size, const UINT32 frag↩ Mem[VOS_MEM_NBLOCKSIZES])

    Initialize the memory unit.
- EXT_DECL void 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 void 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 ∗pMinFree, UINT32 ∗pNumAllocBlocks, UINT32 ∗pNumAllocErr, UINT32 ∗pNumFreeErr, UINT32 block↩ Size[VOS_MEM_NBLOCKSIZES], UINT32 usedBlockSize[VOS_MEM_NBLOCKSIZES])

    Return used and available memory (of memory area above).
- EXT_DECL void vos_qsort (void ∗pBuf, UINT32 num, UINT32 size, int(∗compare)(const void ∗, const void ∗))

    Sort an array.
- EXT_DECL void ∗ vos_bsearch (const void ∗pKey, const void ∗pBuf, UINT32 num, UINT32 size, int(∗compare)(const void ∗, const void ∗))

    Binary search in a sorted array.
- EXT_DECL INT32 vos_strnicmp (const CHAR8 ∗pStr1, const CHAR8 ∗pStr2, UINT32 count)

    Case insensitive string compare.
- EXT_DECL void vos_strncpy (CHAR8 ∗pStrDst, const CHAR8 ∗pStrSrc, UINT32 count)

    String copy with length limitation.
- EXT_DECL void vos_strncat (CHAR8 ∗pStrDst, UINT32 count, const CHAR8 ∗pStrSrc)

    String concatenation with length limitation.
- EXT_DECL VOS_ERR_T vos_queueCreate (VOS_QUEUE_POLICY_T queueType, UINT32 maxNoOfMsg, VOS_QUEUE_T ∗pQueueHandle)

    Initialize a message queue.
- EXT_DECL VOS_ERR_T vos_queueSend (VOS_QUEUE_T queueHandle, UINT8 ∗pData, UINT32 size)

    Send a message.
- EXT_DECL VOS_ERR_T vos_queueReceive (VOS_QUEUE_T queueHandle, UINT8 ∗∗ppData, UINT32 ∗pSize, UINT32 usTimeout)

    Get a message.
- EXT_DECL VOS_ERR_T vos_queueDestroy (VOS_QUEUE_T queueHandle)

    Destroy a message queue.

5.41.1 Detailed Description

Memory and queue functions for OS abstraction.

This module provides memory control supervison

Note

Project: TCNOpen TRDP prototype stack

Author

Bernd Loehr, NewTec GmbH Peter Brander (Memory scheme)

Remarks

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5.41.2 Macro Definition Documentation

5.41.2.1 VOS_MEM_BLOCKSIZES

```
#define VOS_MEM_BLOCKSIZES
```

Value:

```
{34u, 48u, 128u, 180u, 256u, 512u, 1024u, 1480u, 2048u, \
                             4096u, 11520u, 16384u, 32768u, 65536u, 131072u}
```

We internally allocate memory always by these block sizes.

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

5.41.2.2 VOS_MEM_PREALLOCATE

```
#define VOS_MEM_PREALLOCATE {0u, 0u, 0u, 0u, 0u, 0u, 0u, 4u, 0u, 0u, 0u, 0u, 0u, 0u, 0u}
```

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.

5.41.3 Function Documentation

5.41.3.1 vos_bsearch()

```
EXT_DECL void* vos_bsearch (
              const void * pKey,
              const void * pBuf,
              UINT32 num,
              UINT32 size,
              int(*)(const void *, const void *) compare )
```

Binary search in a sorted array.

This is just a wrapper for the standard bsearch function.

Parameters

in	*pKey*	Key to search for
in	*pBuf*	Pointer to the array to search
in	*num*	number of elements
in	*size*	size of one element
in	*compare*	Pointer to compare function return -n if arg1 $<$ arg2, return 0 if arg1 == arg2, return +n if arg1 $>$ arg2 where n is an integer != 0

Return values

Pointer	to found element or NULL

5.41.3.2 vos_memAlloc()

```
EXT_DECL UINT8* vos_memAlloc (
             UINT32 size )
```

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

Parameters

in	*size*	Size of requested block

Return values

Pointer	to memory area
NULL	if no memory available

5.41.3.3 vos_memCount()

```
EXT_DECL VOS_ERR_T vos_memCount (
             UINT32 * pAllocatedMemory,
             UINT32 * pFreeMemory,
             UINT32 * pMinFree,
             UINT32 * pNumAllocBlocks,
             UINT32 * pNumAllocErr,
             UINT32 * pNumFreeErr,
             UINT32 blockSize[VOS_MEM_NBLOCKSIZES],
             UINT32 usedBlockSize[VOS_MEM_NBLOCKSIZES] )
```

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

Parameters

out	*pAllocatedMemory*	Pointer to allocated memory size

Parameters

out	*pFreeMemory*	Pointer to free memory size
out	*pMinFree*	Pointer to minimal free memory size in statistics interval
out	*pNumAllocBlocks*	Pointer to number of allocated memory blocks
out	*pNumAllocErr*	Pointer to number of allocation errors
out	*pNumFreeErr*	Pointer to number of free errors
out	*blockSize*	Pointer to list of memory block sizes
out	*usedBlockSize*	Pointer to list of used memoryblocks

Return values

VOS_NO_ERR	no error
VOS_INIT_ERR	module not initialised

5.41.3.4 vos_memDelete()

```
EXT_DECL void 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

in	*pMemoryArea*	Pointer to memory area to use

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

in	*pMemoryArea*	Pointer to memory area used

5.41.3.5 vos_memFree()

```
EXT_DECL void vos_memFree (
            void * pMemBlock )
```

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

Parameters

in	*pMemBlock*	Pointer to memory block to be freed

5.41.3.6 vos_memInit()

```
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

in	*pMemoryArea*	Pointer to memory area to use
in	*size*	Size of provided memory area
in	*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_memAlloc and vos_memFree. The used block sizes can be supplied and will be preallocated. If half of the overall size of the requested memory area would be pre-allocated, either by the default pre-allocation table or a provided one, no pre-allocation takes place.

Parameters

in	*pMemoryArea*	Pointer to memory area to use
in	*size*	Size of provided memory area
in	*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
VOS_MUTEX_ERR	no mutex available

5.41.3.7 vos_qsort()

```
EXT_DECL void vos_qsort (
            void * pBuf,
            UINT32 num,
            UINT32 size,
            int(*)(const void *, const void *) compare )
```

Sort an array.

This is just a wrapper for the standard qsort function.

Parameters

in,out	*pBuf*	Pointer to the array to sort
in	*num*	number of elements
in	*size*	size of one element
in	*compare*	Pointer to compare function return -n if arg1 < arg2, return 0 if arg1 == arg2, return +n if arg1 > arg2 where n is an integer != 0

Return values

none	

5.41.3.8 vos_queueCreate()

```
EXT_DECL VOS_ERR_T vos_queueCreate (
             VOS_QUEUE_POLICY_T queueType,
             UINT32 maxNoOfMsg,
             VOS_QUEUE_T * pQueueHandle )
```

Initialize a message queue.

Returns a handle for further calls

Parameters

in	*queueType*	Define queue type (1 = FIFO, 2 = LIFO, 3 = PRIO)
in	*maxNoOfMsg*	Maximum number of messages
out	*pQueueHandle*	Handle of created queue

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

5.41.3.9 vos_queueDestroy()

```
EXT_DECL VOS_ERR_T vos_queueDestroy (
            VOS_QUEUE_T queueHandle )
```

Destroy a message queue.

Free all resources used by this queue

Parameters

in	*queueHandle*	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

5.41.3.10 vos_queueReceive()

```
EXT_DECL VOS_ERR_T vos_queueReceive (
            VOS_QUEUE_T queueHandle,
            UINT8 ** ppData,
            UINT32 * pSize,
            UINT32 usTimeout )
```

Get a message.

Parameters

in	*queueHandle*	Queue handle
out	*ppData*	Pointer to data pointer to be received
out	*pSize*	Size of receive data
in	*usTimeout*	Maximum time to wait for a message (in usec)

Return values

VOSNO_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

5.41.3.11 vos_queueSend()

```
EXT_DECL VOS_ERR_T vos_queueSend (
             VOS_QUEUE_T queueHandle,
             UINT8 * pData,
             UINT32 size )
```

Send a message.

Parameters

in	*queueHandle*	Queue handle
in	*pData*	Pointer to data to be sent
in	*size*	Size of data to be sent

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

5.41.3.12 vos_strncat()

```
EXT_DECL void vos_strncat (
             CHAR8 * pStrDst,
             UINT32 count,
             const CHAR8 * pStrSrc )
```

String concatenation with length limitation.

Parameters

in	*pStrDst*	Destination string
in	*count*	Size of destination buffer
in	*pStrSrc*	Null terminated string to append

Return values

none	

5.41.3.13 vos_strncpy()

```
EXT_DECL void vos_strncpy (
             CHAR8 * pStrDst,
             const CHAR8 * pStrSrc,
             UINT32 count )
```

String copy with length limitation.

Parameters

in	*pStrDst*	Destination string
in	*pStrSrc*	Null terminated string to copy
in	*count*	Maximum number of characters to copy

Return values

none	

5.41.3.14 vos_strnicmp()

```
EXT_DECL INT32 vos_strnicmp (
            const CHAR8 * pStr1,
            const CHAR8 * pStr2,
            UINT32 count )
```

Case insensitive string compare.

Parameters

in	*pStr1*	Null terminated string to compare
in	*pStr2*	Null terminated string to compare
in	*count*	Maximum number of characters to compare

Return values

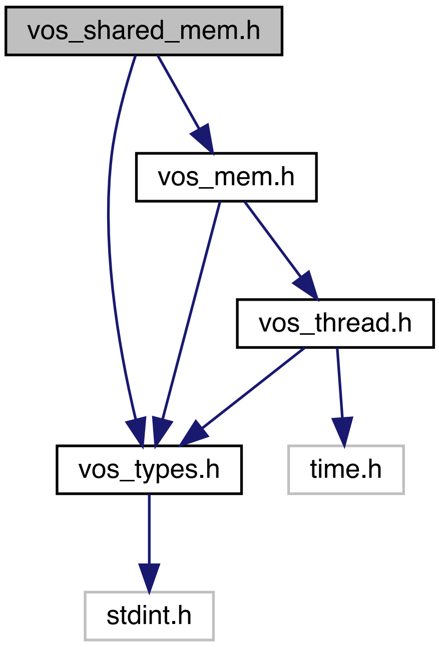
0	- equal
<*0*	- string1 less than string 2
>*0*	- string 1 greater than string 2

5.42 vos_shared_mem.h File Reference

Shared Memory functions for OS abstraction.

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

Include dependency graph for vos_shared_mem.h:



Functions

- EXT_DECL VOS_ERR_T vos_sharedOpen (const CHAR8 ∗pKey, VOS_SHRD_T ∗pHandle, UINT8 ∗∗pp←
MemoryArea, 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.

5.42.1 Detailed Description

Shared Memory functions for OS abstraction.

This module provides shared memory control supervison

Note

Project: TCNOpen TRDP prototype stack

Author

Kazumasa Aiba, TOSHIBA

Remarks

5.42.2 Function Documentation

5.42.2.1 vos_sharedClose()

```
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

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

Return values

VOS_NO_ERR	no error
VOS_MEM_ERR	no memory available

5.42.2.2 vos_sharedOpen()

```
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 opened. This function is not available in each target implementation.

Parameters

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

Return values

VOS_NO_ERR	no error

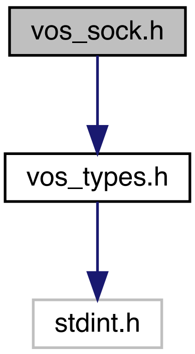
Return values

VOS_MEM_ERR	no memory available

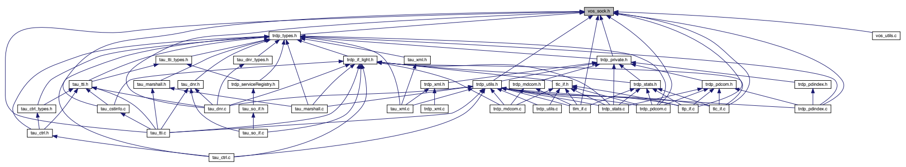
5.43 vos_sock.h File Reference

Typedefs for OS abstraction.

`#include "vos_types.h"`
Include dependency graph for vos_sock.h:



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



Data Structures

- struct VOS_SOCK_OPT_T

    Common socket options.

Macros

- #define VOS_MAX_SOCKET_CNT 4

    The maximum number of sockets influences memory usage; for small systems we should define a smaller set.
- #define VOS_MAX_MULTICAST_CNT 5

    The maximum number of multicast groups one socket can join.
- #define VOS_TTL_MULTICAST 64

    The maximum number of hops a multicast packet can take.
- #define VOS_MAX_IF_NAME_SIZE 16

    The maximum number of IP interface adapters that can be handled by VOS.
- #define VOS_MAX_NUM_IF 8

    The maximum number of unicast addresses that can be handled by VOS.
- #define VOS_MAX_NUM_UNICAST 10

    The MAC size supported by VOS.
- #define VOS_MAC_SIZE 6

    Size of socket send and receive buffer.
- #define VOS_INVALID_SOCKET -1

    Invalid socket number.

Functions

- EXT_DECL UINT16 vos_htons (UINT16 val)

    Byte swapping 2 Bytes.
- 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 UINT64 vos_htonll (UINT64 val)

    Byte swapping 8 Bytes.
- EXT_DECL UINT64 vos_ntohll (UINT64 val)

    Byte swapping 8 Bytes.
- EXT_DECL UINT32 vos_dottedIP (const CHAR8 ∗pDottedIP)

    Convert IP address from dotted dec.
- EXT_DECL const CHAR8 ∗ vos_ipDotted (UINT32 ipAddress)

    Convert IP address to dotted dec.
- EXT_DECL BOOL8 vos_isMulticast (UINT32 ipAddress)

    Check if the supplied address is a multicast group address.
- EXT_DECL VOS_ERR_T vos_getInterfaces (UINT32 ∗pAddrCnt, VOS_IF_REC_T ifAddrs[ ])

    Get a list of interface addresses The caller has to provide an array of interface records to be filled.
- EXT_DECL BOOL8 vos_netIfUp (VOS_IP4_ADDR_T ifAddress)

    Get the state of an interface.
- EXT_DECL INT32 vos_select (SOCKET highDesc, VOS_FDS_T ∗pReadableFD, VOS_FDS_T ∗p↩
WriteableFD, VOS_FDS_T ∗pErrorFD, VOS_TIMEVAL_T ∗pTimeOut)

    select function.
- EXT_DECL VOS_ERR_T vos_sockInit (void)

    Initialize the socket library.
- EXT_DECL void vos_sockTerm (void)

    De-Initialize the socket library.

- EXT_DECL VOS_ERR_T vos_sockGetMAC (UINT8 pMAC[VOS_MAC_SIZE])

  Return the MAC address of the default adapter.
- EXT_DECL VOS_ERR_T vos_sockOpenUDP (SOCKET ∗pSock, const VOS_SOCK_OPT_T ∗pOptions)

  Create an UDP socket.
- EXT_DECL VOS_ERR_T vos_sockOpenTCP (SOCKET ∗pSock, const VOS_SOCK_OPT_T ∗pOptions)

  Create a TCP socket.
- EXT_DECL VOS_ERR_T vos_sockClose (SOCKET sock)

  Close a socket.
- EXT_DECL VOS_ERR_T vos_sockSetOptions (SOCKET sock, const VOS_SOCK_OPT_T ∗pOptions)

  Set socket options.
- EXT_DECL VOS_ERR_T vos_sockJoinMC (SOCKET sock, UINT32 mcAddress, UINT32 ipAddress)

  Join a multicast group.
- EXT_DECL VOS_ERR_T vos_sockLeaveMC (SOCKET sock, UINT32 mcAddress, UINT32 ipAddress)

  Leave a multicast group.
- EXT_DECL VOS_ERR_T vos_sockSendUDP (SOCKET sock, const UINT8 ∗pBuffer, UINT32 ∗pSize, UIN↩ T32 ipAddress, UINT16 port)

  Send UDP data.
- EXT_DECL VOS_ERR_T vos_sockReceiveUDP (SOCKET sock, UINT8 ∗pBuffer, UINT32 ∗pSize, UINT32 ∗pSrcIPAddr, UINT16 ∗pSrcIPPort, UINT32 ∗pDstIPAddr, BOOL8 peek)

  Receive UDP data.
- EXT_DECL VOS_ERR_T vos_sockBind (SOCKET sock, UINT32 ipAddress, UINT16 port)

  Bind a socket to an address and port.
- EXT_DECL VOS_ERR_T vos_sockListen (SOCKET sock, UINT32 backlog)

  Listen for incoming TCP connections.
- EXT_DECL VOS_ERR_T vos_sockAccept (SOCKET sock, SOCKET ∗pSock, UINT32 ∗pIPAddress, UINT16 ∗pPort)

  Accept an incoming TCP connection.
- EXT_DECL VOS_ERR_T vos_sockConnect (SOCKET sock, UINT32 ipAddress, UINT16 port)

  Open a TCP connection.
- EXT_DECL VOS_ERR_T vos_sockSendTCP (SOCKET sock, const UINT8 ∗pBuffer, UINT32 ∗pSize)

  Send TCP data.
- EXT_DECL VOS_ERR_T vos_sockReceiveTCP (SOCKET sock, UINT8 ∗pBuffer, UINT32 ∗pSize)

  Receive TCP data.
- EXT_DECL VOS_ERR_T vos_sockSetMulticastIf (SOCKET sock, UINT32 mcIfAddress)

  Set Using Multicast I/F.
- EXT_DECL VOS_IP4_ADDR_T vos_determineBindAddr (VOS_IP4_ADDR_T srcIP, VOS_IP4_ADDR_↩ T mcGroup, VOS_IP4_ADDR_T rcvMostly)

  Determines the address to bind to since the behaviour in the different OS is different.

5.43.1 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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5.43.2 Macro Definition Documentation

5.43.2.1 VOS_MAX_SOCKET_CNT

```
#define VOS_MAX_SOCKET_CNT 4
```

The maximum number of sockets influences memory usage; for small systems we should define a smaller set.

The maximum number of concurrent usable sockets per application session

5.43.2.2 VOS_TTL_MULTICAST

```
#define VOS_TTL_MULTICAST 64
```

The maximum number of hops a multicast packet can take.

The maximum size for the interface name

5.43.3 Function Documentation

5.43.3.1 vos_determineBindAddr()

```
EXT_DECL VOS_IP4_ADDR_T vos_determineBindAddr (
             VOS_IP4_ADDR_T srcIP,
             VOS_IP4_ADDR_T mcGroup,
             VOS_IP4_ADDR_T rcvMostly )
```

Determines the address to bind to since the behaviour in the different OS is different.

Parameters

in	*srcIP*	IP to bind to (0 = any address)
in	*mcGroup*	MC group to join (0 = do not join)
in	*rcvMostly*	primarily used for receiving (tbd: bind on sender, too?)

Return values

Address	to bind to

5.43.3.2 vos_dottedIP()

```
EXT_DECL UINT32 vos_dottedIP (
            const CHAR8 * pDottedIP )
```

Convert IP address from dotted dec.

to !host! endianess

Parameters

in	*p↩ DottedIP*	IP address as dotted decimal.

Return values

address	in UINT32 in host endianess

5.43.3.3 vos_getInterfaces()

```
EXT_DECL VOS_ERR_T vos_getInterfaces (
            UINT32 * pAddrCnt,
            VOS_IF_REC_T ifAddrs[ ] )
```

Get a list of interface addresses The caller has to provide an array of interface records to be filled.

Parameters

in,out	*pAddrCnt*	in: pointer to array size of interface record out: pointer to number of interface records read
in,out	*ifAddrs*	array of interface records

Return values

VOS_NO_ERR	no error
VOS_PARAM_ERR	pAddrCnt and/or ifAddrs == NULL
VOS_MEM_ERR	memory allocation error
VOS_SOCK_ERR	GetAdaptersInfo() error

5.43.3.4 vos_htonl()

```
EXT_DECL UINT32 vos_htonl (
             UINT32 val )
```

Byte swapping 4 Bytes.

Parameters

in	*val*	Initial value.

Return values

swapped	value

5.43.3.5 vos_htonll()

```
EXT_DECL UINT64 vos_htonll (
             UINT64 val )
```

Byte swapping 8 Bytes.

Parameters

in	*val*	Initial value.

Return values

swapped	value

5.43.3.6 vos_htons()

```
EXT_DECL UINT16 vos_htons (
             UINT16 val )
```

Byte swapping 2 Bytes.

Parameters

in	*val*	Initial value.

Return values

swapped	value

5.43.3.7 vos_ipDotted()

```
EXT_DECL const CHAR8* vos_ipDotted (
             UINT32 ipAddress )
```

Convert IP address to dotted dec.

from !host! endianess

Parameters

in	*ipAddress*	address in UINT32 in host endianess

Return values

IP	address as dotted decimal.

5.43.3.8 vos_isMulticast()

```
EXT_DECL BOOL8 vos_isMulticast (
             UINT32 ipAddress )
```

Check if the supplied address is a multicast group address.

Parameters

in	*ipAddress*	IP address to check.

Return values

TRUE	address is a multicast address
FALSE	address is not a multicast address

5.43.3.9 vos_netIfUp()

```
EXT_DECL BOOL8 vos_netIfUp (
             VOS_IP4_ADDR_T ifAddress )
```

Get the state of an interface.

Parameters

in	*ifAddress*	address of interface to check

Return values

TRUE	interface is up and ready FALSE interface is down / not ready

5.43.3.10 vos_ntohl()

```
EXT_DECL UINT32 vos_ntohl (
             UINT32 val )
```

Byte swapping 4 Bytes.

Parameters

in	*val*	Initial value.

Return values

swapped	value

5.43.3.11 vos_ntohll()

```
EXT_DECL UINT64 vos_ntohll (
             UINT64 val )
```

Byte swapping 8 Bytes.

Parameters

in	*val*	Initial value.

Return values

swapped	value

5.43.3.12 vos_ntohs()

```
EXT_DECL UINT16 vos_ntohs (
             UINT16 val )
```

Byte swapping 2 Bytes.

Parameters

in	*val*	Initial value.

Return values

swapped	value

5.43.3.13 vos_select()

```
EXT_DECL INT32 vos_select (
             SOCKET highDesc,
             VOS_FDS_T * pReadableFD,
             VOS_FDS_T * pWriteableFD,
             VOS_FDS_T * pErrorFD,
             VOS_TIMEVAL_T * pTimeOut )
```

select function.

Set the ready sockets in the supplied sets. Note: Some target systems might define this function as NOP.

Parameters

in	*highDesc*	max. socket descriptor + 1
in,out	*pReadableFD*	pointer to readable socket set
in,out	*pWriteableFD*	pointer to writeable socket set
in,out	*pErrorFD*	pointer to error socket set
in	*pTimeOut*	pointer to time out value

Return values

number	of ready file descriptors

5.43.3.14 vos_sockAccept()

```
EXT_DECL VOS_ERR_T vos_sockAccept (
             SOCKET sock,
             SOCKET * 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

in	*sock*	Socket descriptor
out	*pSock*	Pointer to socket descriptor, on exit new socket
out	*pIPAddress*	source IP to receive on, 0 for any
out	*pPort*	port to receive on, 17224 for PD

Return values

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

5.43.3.15 vos_sockBind()

```
EXT_DECL VOS_ERR_T vos_sockBind (
              SOCKET sock,
              UINT32 ipAddress,
              UINT16 port )
```

Bind a socket to an address and port.

Parameters

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

Return values

VOS_NO_ERR	no error
VOS_PARAM_ERR	parameter out of range/invalid
VOS_IO_ERR	Input/Output error
VOS_MEM_ERR	resource error

5.43.3.16 vos_sockClose()

```
EXT_DECL VOS_ERR_T vos_sockClose (
              SOCKET sock )
```

Close a socket.

Release any resources aquired by this socket

Parameters

in	*sock*	socket descriptor

Return values

VOS_NO_ERR	no error
VOS_PARAM_ERR	pSock == NULL

5.43.3.17 vos_sockConnect()

```
EXT_DECL VOS_ERR_T vos_sockConnect (
              SOCKET sock,
              UINT32 ipAddress,
              UINT16 port )
```

Open a TCP connection.

Parameters

in	*sock*	socket descriptor
in	*ipAddress*	destination IP
in	*port*	destination port

Return values

VOS_NO_ERR	no error
VOS_PARAM_ERR	parameter out of range/invalid
VOS_IO_ERR	Input/Output error

5.43.3.18 vos_sockGetMAC()

```
EXT_DECL VOS_ERR_T vos_sockGetMAC (
              UINT8 pMAC[VOS_MAC_SIZE] )
```

Return the MAC address of the default adapter.

Parameters

out	*pMAC*	return MAC address.

Return values

VOS_NO_ERR	no error
VOS_PARAM_ERR	pMAC == NULL

Return values

VOS_SOCK_ERR	socket not available or option not supported

5.43.3.19 vos_sockInit()

```
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

5.43.3.20 vos_sockJoinMC()

```
EXT_DECL VOS_ERR_T vos_sockJoinMC (
             SOCKET sock,
             UINT32 mcAddress,
             UINT32 ipAddress )
```

Join a multicast group.

Note: Some target systems might not support this option.

Parameters

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

Return values

VOS_NO_ERR	no error
VOS_PARAM_ERR	parameter out of range/invalid
VOS_SOCK_ERR	option not supported

5.43.3.21 vos_sockLeaveMC()

```
EXT_DECL VOS_ERR_T vos_sockLeaveMC (
            SOCKET sock,
            UINT32 mcAddress,
            UINT32 ipAddress )
```

Leave a multicast group.

Note: Some target systems might not support this option.

Parameters

in	*sock*	socket descriptor
in	*mcAddress*	multicast group to join
in	*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

5.43.3.22 vos_sockListen()

```
EXT_DECL VOS_ERR_T vos_sockListen (
            SOCKET sock,
            UINT32 backlog )
```

Listen for incoming TCP connections.

Parameters

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

Return values

VOS_NO_ERR	no error
VOS_PARAM_ERR	parameter out of range/invalid
VOS_IO_ERR	Input/Output error
VOS_MEM_ERR	resource error

5.43.3.23 vos_sockOpenTCP()

```
EXT_DECL VOS_ERR_T vos_sockOpenTCP (
            SOCKET * 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

out	*pSock*	pointer to socket descriptor returned
in	*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

5.43.3.24 vos_sockOpenUDP()

```
EXT_DECL VOS_ERR_T vos_sockOpenUDP (
            SOCKET * 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

out	*pSock*	pointer to socket descriptor returned
in	*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

5.43.3.25 vos_sockReceiveTCP()

```
EXT_DECL VOS_ERR_T vos_sockReceiveTCP (
            SOCKET sock,
            UINT8 * pBuffer,
            UINT32 * 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 occured. If called in non-blocking mode, and no data is available, VOS_NODATA_ERR will be returned.

Parameters

in	*sock*	socket descriptor
out	*pBuffer*	pointer to applications data buffer
in,out	*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
VOS_BLOCK_ERR	call would have blocked in blocking mode

5.43.3.26 vos_sockReceiveUDP()

```
EXT_DECL VOS_ERR_T vos_sockReceiveUDP (
            SOCKET sock,
            UINT8 * pBuffer,
            UINT32 * pSize,
            UINT32 * pSrcIPAddr,
            UINT16 * pSrcIPPort,
            UINT32 * pDstIPAddr,
            BOOL8 peek )
```

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 occured. If called in non-blocking mode, and no data is available, VOS_NODATA_ERR will be returned. If pointers are provided, source IP, source port and destination IP will be reported on return.

Parameters

in	*sock*	socket descriptor
out	*pBuffer*	pointer to applications data buffer
in,out	*pSize*	pointer to the received data size
out	*pSrcIPAddr*	pointer to source IP
out	*pSrcIPPort*	pointer to source port
out	*pDstIPAddr*	pointer to dest IP
in	*peek*	if true, leave data in queue

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
VOS_BLOCK_ERR	Call would have blocked in blocking mode

5.43.3.27 vos_sockSendTCP()

```
EXT_DECL VOS_ERR_T vos_sockSendTCP (
             SOCKET sock,
             const UINT8 * pBuffer,
             UINT32 * pSize )
```

Send TCP data.

Send data to the supplied address and port.

Parameters

`in`	*sock*	socket descriptor
`in`	*pBuffer*	pointer to data to send
`in,out`	*pSize*	In: size of the data to send, Out: no of bytes sent

Return values

VOS_NO_ERR	no error
VOS_PARAM_ERR	sock descriptor unknown, parameter error
VOS_IO_ERR	data could not be sent
VOS_NOCONN_ERR	no TCP connection
VOS_BLOCK_ERR	call would have blocked in blocking mode, data partially sent

5.43.3.28 vos_sockSendUDP()

```
EXT_DECL VOS_ERR_T vos_sockSendUDP (
             SOCKET sock,
             const UINT8 * pBuffer,
             UINT32 * pSize,
             UINT32 ipAddress,
             UINT16 port )
```

Send UDP data.

Send data to the given address and port.

Parameters

in	*sock*	socket descriptor
in	*pBuffer*	pointer to data to send
in,out	*pSize*	In: size of the data to send, Out: no of bytes sent
in	*ipAddress*	destination IP
in	*port*	destination port

Return values

VOS_NO_ERR	no error
VOS_PARAM_ERR	parameter out of range/invalid
VOS_IO_ERR	data could not be sent
VOS_BLOCK_ERR	Call would have blocked in blocking mode

5.43.3.29 vos_sockSetMulticastIf()

```
EXT_DECL VOS_ERR_T vos_sockSetMulticastIf (
             SOCKET sock,
             UINT32 mcIfAddress )
```

Set Using Multicast I/F.

Parameters

in	*sock*	socket descriptor
in	*mcIfAddress*	using Multicast I/F Address

Return values

VOS_NO_ERR	no error
VOS_PARAM_ERR	sock descriptor unknown, parameter error

5.43.3.30 vos_sockSetOptions()

```
EXT_DECL VOS_ERR_T vos_sockSetOptions (
             SOCKET sock,
             const VOS_SOCK_OPT_T * pOptions )
```

Set socket options.

Note: Some target systems might not support each option.

Parameters

in	*sock*	socket descriptor
in	*pOptions*	pointer to socket options (optional)

Return values

VOS_NO_ERR	no error
VOS_PARAM_ERR	parameter out of range/invalid

5.43.3.31 vos_sockTerm()

```
EXT_DECL void vos_sockTerm (
             void  )
```

De-Initialize the socket library.

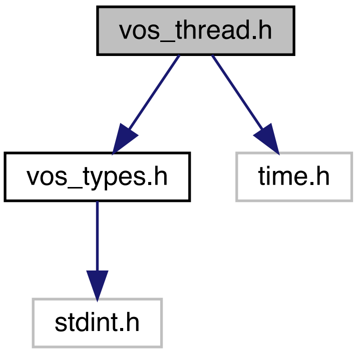
Must be called after last socket call

5.44 vos_thread.h File Reference

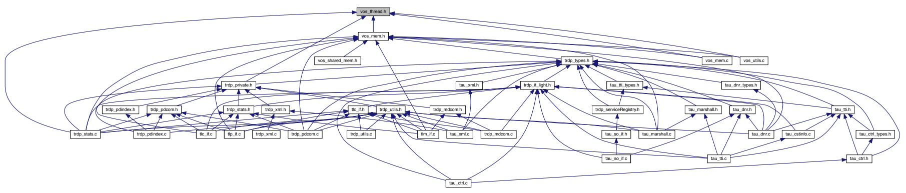
Threading functions for OS abstraction.

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

Include dependency graph for vos_thread.h:



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



Macros

- #define VOS_MAX_THREAD_CNT 100

    The maximum number of concurrent usable threads.
- #define VOS_SEMA_WAIT_FOREVER 0xFFFFFFFFU

    Timeout value to wait forever for a semaphore.

Typedefs

- typedef UINT8 VOS_THREAD_PRIORITY_T

    Thread priority range from 1 (lowest) to 255 (highest), 0 default of the target system.
- typedef void(__cdecl ∗ VOS_THREAD_FUNC_T) (void ∗pArg)

    Thread function definition.
- typedef struct VOS_MUTEX ∗ VOS_MUTEX_T

    Hidden mutex handle definition.
- typedef struct VOS_SEMA ∗ 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 void vos_threadTerm (void)

    De-Initialize the thread library.
- EXT_DECL VOS_ERR_T vos_threadCreateSync (VOS_THREAD_T ∗pThread, const CHAR8 ∗pName, VOS_THREAD_POLICY_T policy, VOS_THREAD_PRIORITY_T priority, UINT32 interval, VOS_TIMEVAL_T ∗pStartTime, UINT32 stackSize, VOS_THREAD_FUNC_T pFunction, void ∗pArguments)

    Create a thread.
- 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_threadSelf (VOS_THREAD_T ∗pThread)

Return thread handle of calling task.
- EXT_DECL void vos_getTime (VOS_TIMEVAL_T ∗pTime)

  Return the current monotonic time in sec and us.
- EXT_DECL void vos_getRealTime (VOS_TIMEVAL_T ∗pTime)

  Return the current real time in sec and us.
- EXT_DECL const CHAR8 ∗ vos_getTimeStamp (void)

  Get a time-stamp string.
- EXT_DECL void vos_clearTime (VOS_TIMEVAL_T ∗pTime)

  Clear the time stamp.
- EXT_DECL void vos_addTime (VOS_TIMEVAL_T ∗pTime, const VOS_TIMEVAL_T ∗pAdd)

  Add the second to the first time stamp, return sum in first.
- EXT_DECL void vos_subTime (VOS_TIMEVAL_T ∗pTime, const VOS_TIMEVAL_T ∗pSub)

  Subtract the second from the first time stamp, return diff in first.
- EXT_DECL INT32 vos_cmpTime (const VOS_TIMEVAL_T ∗pTime, const VOS_TIMEVAL_T ∗pCmp)

  Compare the second from the first time stamp, return diff in first.
- EXT_DECL void vos_divTime (VOS_TIMEVAL_T ∗pTime, UINT32 divisor)

  Divide the first time by the second, return quotient in first.
- EXT_DECL void vos_mulTime (VOS_TIMEVAL_T ∗pTime, UINT32 mul)

  Multiply the first time by the second, return product in first.
- EXT_DECL void 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 void vos_mutexDelete (VOS_MUTEX_T pMutex)

  Delete a mutex.
- EXT_DECL VOS_ERR_T vos_mutexLock (VOS_MUTEX_T pMutex)

  Take a mutex.
- EXT_DECL VOS_ERR_T vos_mutexTryLock (VOS_MUTEX_T pMutex)

  Try to take a mutex.
- EXT_DECL VOS_ERR_T vos_mutexUnlock (VOS_MUTEX_T pMutex)

  Release a mutex.
- EXT_DECL VOS_ERR_T vos_semaCreate (VOS_SEMA_T ∗pSema, VOS_SEMA_STATE_T initialState)

  Create a semaphore.
- EXT_DECL void 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 void vos_semaGive (VOS_SEMA_T sema)

  Give a semaphore.

5.44.1 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

5.44.2 Function Documentation

5.44.2.1 vos_addTime()

```
EXT_DECL void vos_addTime (
             VOS_TIMEVAL_T * pTime,
             const VOS_TIMEVAL_T * pAdd )
```

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

Parameters

in,out	*pTime*	Pointer to time value
in	*pAdd*	Pointer to time value

5.44.2.2 vos_clearTime()

```
EXT_DECL void vos_clearTime (
             VOS_TIMEVAL_T * pTime )
```

Clear the time stamp.

Parameters

out	*pTime*	Pointer to time value

5.44.2.3 vos_cmpTime()

```
EXT_DECL INT32 vos_cmpTime (
             const VOS_TIMEVAL_T * pTime,
             const VOS_TIMEVAL_T * pCmp )
```

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

Parameters

`in,out`	*pTime*	Pointer to time value
`in`	*pCmp*	Pointer to time value to compare

Return values

0	pTime == pCmp
-1	pTime < pCmp
1	pTime > pCmp

5.44.2.4 vos_divTime()

```
EXT_DECL void vos_divTime (
             VOS_TIMEVAL_T * pTime,
             UINT32 divisor )
```

Divide the first time by the second, return quotient in first.

Parameters

`in,out`	*pTime*	Pointer to time value
`in`	*divisor*	Divisor

5.44.2.5 vos_getRealTime()

```
EXT_DECL void vos_getRealTime (
             VOS_TIMEVAL_T * pTime )
```

Return the current real time in sec and us.

Parameters

`out`	*pTime*	Pointer to time value

5.44.2.6 vos_getTime()

```
EXT_DECL void vos_getTime (
             VOS_TIMEVAL_T * pTime )
```

Return the current monotonic time in sec and us.

Parameters

out	*pTime*	Pointer to time value

5.44.2.7 vos_getTimeStamp()

```
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"

5.44.2.8 vos_getUuid()

```
EXT_DECL void vos_getUuid (
             VOS_UUID_T pUuID )
```

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

Parameters

out	*pUuID*	Pointer to a universal unique identifier

5.44.2.9 vos_mulTime()

```
EXT_DECL void vos_mulTime (
             VOS_TIMEVAL_T * pTime,
             UINT32 mul )
```

Multiply the first time by the second, return product in first.

Parameters

in,out	*pTime*	Pointer to time value
in	*mul*	Factor

5.44.2.10 vos_mutexCreate()

```
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

out	*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

5.44.2.11 vos_mutexDelete()

```
EXT_DECL void vos_mutexDelete (
             VOS_MUTEX_T pMutex )
```

Delete a mutex.

Release the resources taken by the mutex.

Parameters

in	*pMutex*	mutex handle

Return values

VOS_NO_ERR	no error

5.44.2.12 vos_mutexLock()

```
EXT_DECL VOS_ERR_T vos_mutexLock (
             VOS_MUTEX_T pMutex )
```

Take a mutex.

Wait for the mutex to become available (lock).

Parameters

in	*pMutex*	mutex handle

Return values

VOS_NO_ERR	no error
VOS_INIT_ERR	module not initialised
VOS_NOINIT_ERR	invalid handle

5.44.2.13 vos_mutexTryLock()

```
EXT_DECL VOS_ERR_T vos_mutexTryLock (
             VOS_MUTEX_T pMutex )
```

Try to take a mutex.

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

Parameters

in	*pMutex*	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

5.44.2.14 vos_mutexUnlock()

```
EXT_DECL VOS_ERR_T vos_mutexUnlock (
             VOS_MUTEX_T pMutex )
```

Release a mutex.

Unlock the mutex.

Parameters

in	*pMutex*	mutex handle

5.44.2.15 vos_semaCreate()

```
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

out	*pSema*	Pointer to semaphore handle
in	*initialState*	The initial state of the sempahore

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

5.44.2.16 vos_semaDelete()

```
EXT_DECL void vos_semaDelete (
            VOS_SEMA_T sema )
```

Delete a semaphore.

This will eventually release any processes waiting for the semaphore.

Parameters

in	*sema*	semaphore handle

5.44.2.17 vos_semaGive()

```
EXT_DECL void vos_semaGive (
            VOS_SEMA_T sema )
```

Give a semaphore.

Release (increase) a semaphore.

Parameters

in	*sema*	semaphore handle

5.44.2.18 vos_semaTake()

```
EXT_DECL VOS_ERR_T vos_semaTake (
             VOS_SEMA_T sema,
             UINT32 timeout )
```

Take a semaphore.

Try to get (decrease) a semaphore.

Parameters

in	*sema*	semaphore handle
in	*timeout*	Max. time in us to wait, 0 means no wait

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

5.44.2.19 vos_subTime()

```
EXT_DECL void vos_subTime (
             VOS_TIMEVAL_T * pTime,
             const VOS_TIMEVAL_T * pSub )
```

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

Parameters

in,out	*pTime*	Pointer to time value
in	*pSub*	Pointer to time value

5.44.2.20 vos_threadCreate()

```
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

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

5.44.2.21 vos_threadCreateSync()

```
EXT_DECL VOS_ERR_T vos_threadCreateSync (
            VOS_THREAD_T * pThread,
            const CHAR8 * pName,
            VOS_THREAD_POLICY_T policy,
            VOS_THREAD_PRIORITY_T priority,
            UINT32 interval,
            VOS_TIMEVAL_T * pStartTime,
            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

out	*pThread*	Pointer to returned thread handle
in	*pName*	Pointer to name of the thread (optional)

Parameters

in	*policy*	Scheduling policy (FIFO, Round Robin or other)
in	*priority*	Scheduling priority (1...255 (highest), default 0)
in	*interval*	Interval for cyclic threads in us (optional)
in	*pStartTime*	Starting time for cyclic threads
in	*stackSize*	Minimum stacksize, default 0: 16kB
in	*pFunction*	Pointer to the thread function
in	*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

5.44.2.22 vos_threadDelay()

```
EXT_DECL VOS_ERR_T vos_threadDelay (
             UINT32 delay )
```

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

Parameters

in	*delay*	Delay in us

Return values

VOS_NO_ERR	no error
VOS_INIT_ERR	module not initialised

5.44.2.23 vos_threadInit()

```
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

5.44.2.24 vos_threadIsActive()

```
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

in	*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

5.44.2.25 vos_threadSelf()

```
EXT_DECL VOS_ERR_T vos_threadSelf (
             VOS_THREAD_T * pThread )
```

Return thread handle of calling task.

Parameters

out	*pThread*	pointer to thread handle

Return values

VOS_NO_ERR	no error
VOS_PARAM_ERR	parameter out of range/invalid

5.44.2.26 vos_threadTerm()

```
EXT_DECL void vos_threadTerm (
             void )
```

De-Initialize the thread library.

Must be called after last thread/timer call

5.44.2.27 vos_threadTerminate()

```
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

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

Return values

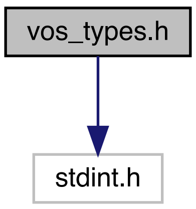
VOS_NO_ERR	no error
VOS_INIT_ERR	module not initialised
VOS_NOINIT_ERR	invalid handle
VOS_PARAM_ERR	parameter out of range/invalid

5.45 vos_types.h File Reference

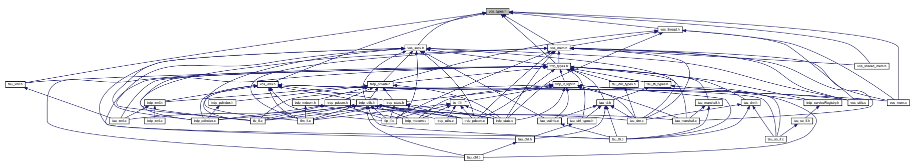
Typedefs for OS abstraction.

```
#include <stdint.h>
```

Include dependency graph for vos_types.h:



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



Data Structures

- struct VOS_VERSION_T

  Version information.

Macros

- #define INLINE inline

  inline macros
- #define AV_ERROR 0x00

  ANTIVALENT8 values.
- #define TR_DIR1 0x01

  Directions/Orientations.

Typedefs

- typedef UINT8 VOS_UUID_T[16]

  universal unique identifier according to RFC 4122, time based version
- typedef struct timeval VOS_TIMEVAL_T

  Timer value compatible with timeval / select.
- 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.

Enumerations

- enum VOS_ERR_T {
  VOS_NO_ERR = 0,
  VOS_PARAM_ERR = -1,
  VOS_INIT_ERR = -2,
  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_BLOCK_ERR = -14,
  VOS_INTEGRATION_ERR = -15,
  VOS_NOCONN_ERR = -16,
  VOS_INUSE_ERR = -49,
  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,
  VOS_LOG_USR = 4 }

  Categories for logging.

5.45.1 Detailed Description

Typedefs for OS abstraction.

Note

Project: TCNOpen TRDP prototype stack

Author

Bernd Loehr, NewTec GmbH

Remarks

5.45.2 Typedef Documentation

5.45.2.1 VOS_PRINT_DBG_T

```
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

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

5.45.2.2 VOS_TIMEVAL_T

```
typedef struct timeval VOS_TIMEVAL_T
```

Timer value compatible with timeval / select.

Relative or absolute date, depending on usage Assume 32 Bit system, if not defined

5.45.3 Enumeration Type Documentation

5.45.3.1 VOS_ERR_T

```
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	Timout.
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_BLOCK_ERR	System call would have blocked in blocking mode.
VOS_INTEGRATION_ERR	Alignment or endianess for selected target wrong.
VOS_NOCONN_ERR	No TCP connection.
VOS_INUSE_ERR	Resource is still in use.
VOS_UNKNOWN_ERR	Unknown error.

5.45.3.2 VOS_LOG_T

```
enum VOS_LOG_T
```

Categories for logging.

Enumerator

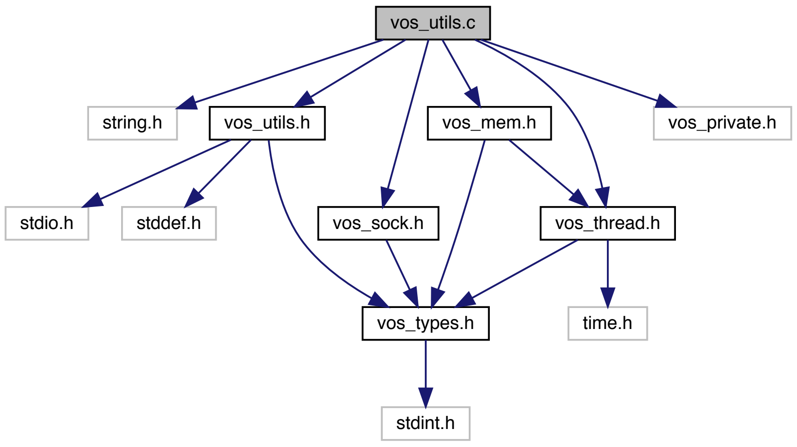
VOS_LOG_ERROR	This is a critical error.
VOS_LOG_WARNING	This is a warning.
VOS_LOG_INFO	This is an info.
VOS_LOG_DBG	This is a debug info.
VOS_LOG_USR	This is a user info.

5.46 vos_utils.c File Reference

Common functions for VOS.

```
#include <string.h>
#include "vos_utils.h"
#include "vos_sock.h"
#include "vos_thread.h"
#include "vos_mem.h"
#include "vos_private.h"
```

Include dependency graph for vos_utils.c:



Functions

- int vos_hostIsBigEndian ()

  Return 1 if this is a big endian machine.
- VOS_ERR_T vos_init (void ∗pRefCon, VOS_PRINT_DBG_T pDebugOutput)

  Initialize the virtual operating system.
- EXT_DECL void vos_terminate (void)

  DeInitialize the vos library.
- UINT32 vos_crc32 (UINT32 crc, const UINT8 ∗pData, UINT32 dataLen)

  Compute crc32 according to IEEE802.3.
- UINT32 vos_sc32 (UINT32 crc, const UINT8 ∗pData, UINT32 dataLen)

  Compute crc32 according to IEC 61375-2-3 B.7.
- const char ∗ vos_getVersionString (void)

  Return a human readable version representation.
- EXT_DECL const VOS_VERSION_T ∗ vos_getVersion (void)

  Return version.
- EXT_DECL const CHAR8 ∗ vos_getErrorString (VOS_ERR_T error)

  Return a human readable error representation.

5.46.1 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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5.46.2 Function Documentation

5.46.2.1 vos_crc32()

```
UINT32 vos_crc32 (
            UINT32 crc,
            const UINT8 * pData,
            UINT32 dataLen )
```

Compute crc32 according to IEEE802.3.

Calculate CRC for the given buffer and length.

/ to IEC 61375-2-3 A.3 Note: Returned CRC is inverted

Parameters

in	*crc*	Initial value.
in,out	*pData*	Pointer to data.
in	*dataLen*	length in bytes of data.

Return values

crc32	according to IEEE802.3

5.46.2.2 vos_getErrorString()

```
EXT_DECL const CHAR8* vos_getErrorString (
             VOS_ERR_T error )
```

Return a human readable error representation.

Parameters

in	*error*	The TRDP or VOS error code

Return values

const	string pointer to error string

5.46.2.3 vos_getVersion()

```
EXT_DECL const VOS_VERSION_T* vos_getVersion (
             void  )
```

Return version.

Return pointer to version structure

Return values

VOS_VERSION_T	

5.46.2.4 vos_getVersionString()

```
const char* vos_getVersionString (
             void  )
```

Return a human readable version representation.

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

Return values

const	string

5.46.2.5 vos_hostIsBigEndian()

```
int vos_hostIsBigEndian (
            void )
```

Return 1 if this is a big endian machine.

Return values

0	if machine is little endian
1	if machine is big endian

5.46.2.6 vos_init()

```
VOS_ERR_T vos_init (
            void * pRefCon,
            VOS_PRINT_DBG_T pDebugOutput )
```

Initialize the virtual operating system.

Initialize the vos library.

Parameters

in	*pRefCon*	context for debug output function
in	*pDebugOutput*	Pointer to debug output function.

Return values

VOS_NO_ERR	no error VOS_INTEGRATION_ERR if endianess/alignment mismatch VOS_SOCK_ERR sockets not supported VOS_UNKNOWN_ERR initialisation error

5.46.2.7 vos_sc32()

```
UINT32 vos_sc32 (
            UINT32 crc,
            const UINT8 * pData,
            UINT32 dataLen )
```

Compute crc32 according to IEC 61375-2-3 B.7.

Compute crc32 according to IEC 61375-2-3 B.7 Note: Returned CRC is inverted.

Parameters

in	*crc*	Initial value.
in,out	*pData*	Pointer to data.
in	*dataLen*	length in bytes of data.

Return values

sc32	according to IEC 61375-2-3

5.46.2.8 vos_terminate()

```
EXT_DECL void vos_terminate (
             void  )
```

DeInitialize the vos library.

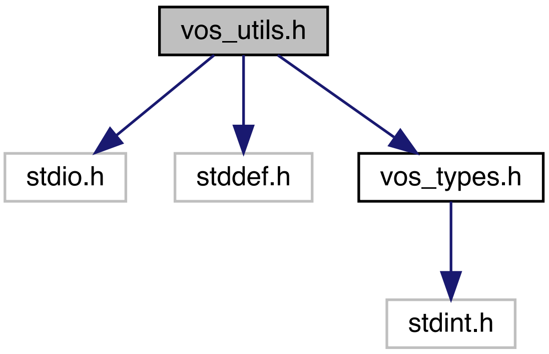
Should be called last after TRDP stack/application does not use any VOS function anymore.

5.47 vos_utils.h File Reference

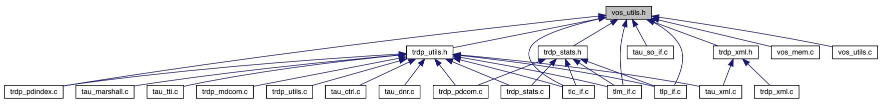
Typedefs for OS abstraction.

```
#include <stdio.h>
#include <stddef.h>
#include "vos_types.h"
```

Include dependency graph for vos_utils.h:



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



Macros

- #define VOS_MAX_PRNT_STR_SIZE 256u

  String size definitions for the debug output functions.
- #define VOS_MAX_FRMT_SIZE 64u

  Max.
- #define VOS_MAX_ERR_STR_SIZE (VOS_MAX_PRNT_STR_SIZE - VOS_MAX_FRMT_SIZE)

  Max.
- #define VOS_DIR_SEP '/'

  This is a helper define for separating a path in debug output.
- #define vos_snprintf(str, size, format, args ...) snprintf(str, size, format, ## args) /∗lint !e586 logging output needed ∗/

  Safe printf function.
- #define vos_printLogStr(level, string)

  Debug output macro without formatting options.
- #define vos_printLog(level, format, args ...)

  Debug output macro with formatting options.
- #define ALIGNOF(type) ((UINT32)offsetof(struct { char c; type member; }, member))

  Alignment macros.
- #define INITFCS 0xffffffffu

  CRC/FCS constants.
- #define SIZE_OF_FCS 4u

  for better understanding of address calculations
- #define L_ENDIAN

  Define endianess if not already done by compiler.

Functions

- EXT_DECL int vos_hostIsBigEndian (void)

  Return 1 if this is a big endian machine.
- EXT_DECL UINT32 vos_crc32 (UINT32 crc, const UINT8 ∗pData, UINT32 dataLen)

  Calculate CRC for the given buffer and length.
- EXT_DECL UINT32 vos_sc32 (UINT32 crc, const UINT8 ∗pData, UINT32 dataLen)

  Compute crc32 according to IEC 61375-2-3 B.7 Note: Returned CRC is inverted.
- EXT_DECL VOS_ERR_T vos_init (void ∗pRefCon, VOS_PRINT_DBG_T pDebugOutput)

  Initialize the vos library.
- EXT_DECL void vos_terminate (void)

  DeInitialize the vos library.
- EXT_DECL const CHAR8 ∗ vos_getVersionString (void)

  Return a human readable version representation.
- EXT_DECL const VOS_VERSION_T ∗ vos_getVersion (void)

  Return version.
- EXT_DECL const CHAR8 ∗ vos_getErrorString (VOS_ERR_T error)

  Return a human readable error representation.

5.47.1 Detailed Description

Typedefs for OS abstraction.

Note

Project: TCNOpen TRDP prototype stack

Author

Bernd Loehr, NewTec GmbH

Remarks

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5.47.2 Macro Definition Documentation

5.47.2.1 INITFCS

```
#define INITFCS 0xffffffffu
```

CRC/FCS constants.

Initial FCS value

5.47.2.2 VOS_MAX_ERR_STR_SIZE

```
#define VOS_MAX_ERR_STR_SIZE (VOS_MAX_PRNT_STR_SIZE - VOS_MAX_FRMT_SIZE)
```

Max.

size of the error part

5.47.2.3 VOS_MAX_FRMT_SIZE

```
#define VOS_MAX_FRMT_SIZE 64u
```

Max.

size of the 'format' part

5.47.2.4 VOS_MAX_PRNT_STR_SIZE

```
#define VOS_MAX_PRNT_STR_SIZE 256u
```

String size definitions for the debug output functions.

Max. size of the debug/error string of debug function

5.47.3 Function Documentation

5.47.3.1 vos_crc32()

```
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. Note↩ : Returned CRC is inverted

Parameters

in	*crc*	Initial value.
in,out	*pData*	Pointer to data.
in	*dataLen*	length in bytes of data.

Return values

crc32	according to IEEE802.3

Calculate CRC for the given buffer and length.

/ to IEC 61375-2-3 A.3 Note: Returned CRC is inverted

Parameters

in	*crc*	Initial value.
in,out	*pData*	Pointer to data.
in	*dataLen*	length in bytes of data.

Return values

crc32	according to IEEE802.3

5.47.3.2 vos_getErrorString()

```
EXT_DECL const CHAR8* vos_getErrorString (
             VOS_ERR_T error )
```

Return a human readable error representation.

Parameters

in	*error*	The TRDP or VOS error code

Return values

const	string pointer to error string

5.47.3.3 vos_getVersion()

```
EXT_DECL const VOS_VERSION_T* vos_getVersion (
             void  )
```

Return version.

Return pointer to version structure

Return values

const	VOS_VERSION_T

Return pointer to version structure

Return values

VOS_VERSION_T	

5.47.3.4 vos_getVersionString()

```
EXT_DECL const CHAR8* vos_getVersionString (
             void  )
```

Return a human readable version representation.

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

Return values

const	string

5.47.3.5 vos_hostIsBigEndian()

```
EXT_DECL int vos_hostIsBigEndian (
             void   )
```

Return 1 if this is a big endian machine.

Return values

0	if machine is little endian
1	if machine is big endian

5.47.3.6 vos_init()

```
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

in	*pRefCon*	user context
in	*pDebugOutput*	pointer to debug output function

Return values

VOS_NO_ERR	no error
VOS_INIT_ERR	unsupported

Initialize the vos library.

Parameters

in	*pRefCon*	context for debug output function
in	*pDebugOutput*	Pointer to debug output function.

Return values

VOS_NO_ERR	no error VOS_INTEGRATION_ERR if endianess/alignment mismatch VOS_SOCK_ERR sockets not supported VOS_UNKNOWN_ERR initialisation error

5.47.3.7 vos_sc32()

```
EXT_DECL UINT32 vos_sc32 (
            UINT32 crc,
            const UINT8 * pData,
            UINT32 dataLen )
```

Compute crc32 according to IEC 61375-2-3 B.7 Note: Returned CRC is inverted.

Parameters

in	*crc*	Initial value.
in,out	*pData*	Pointer to data.
in	*dataLen*	length in bytes of data.

Return values

crc32	according to IEC 61375-2-3

Compute crc32 according to IEC 61375-2-3 B.7 Note: Returned CRC is inverted.

Parameters

in	*crc*	Initial value.
in,out	*pData*	Pointer to data.
in	*dataLen*	length in bytes of data.

Return values

sc32	according to IEC 61375-2-3

5.47.3.8 vos_terminate()

```
EXT_DECL void vos_terminate (
            void )
```

DeInitialize the vos library.

Should be called last after TRDP stack/application does not use any VOS function anymore.

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