TCNOpen Open Source Development

TRDP

Train Real Time Data Protocol

TRDP SPY - Reference Manual

Contents

Chapter 1

TRDP-SPY

1.1 Introduction

1.1.1 Purpose

As part of the IP-Train project, two new protocols namely TRDP-PD (Process Data) and TRDP-MD (Message Data) are intended to be supported by the Wireshark tool. The support is envisaged to be made available in the form of a plug-in.

The existing GUI of the Wireshark V1.8.3 shall not be modified. The plug-in TRDP-SPY shall be available as a DLL for Windows platform and shared library for TRDP-spy for Linux platform.

1.1.2 Intended Audience

The TRDP-SPY will be used primarily by TRDP Engineers.

1.2 Design Description

1.2.1 System

TRDP Wire Protocol Analysis tool (TRDP-SPY) shall provide qualitative and quantitative analysis of TRDP streams, in order to verify system behaviour during qualification tests (level 2 and level 3) and provide help in problem analysis during train integration and debugging.

1.2.2 Operational Environment

The plug-in shall be compatible with Windows XP and Linux implementation of Wireshark. Standard behavior of Wireshark for all other protocols than WP shall not be influenced in any way by the TRDPWP analysis plug-in.

The plug-in shall be delivered as a DLL (Windows) along with the Wireshark-setup.exe and shared Library (.la, .lai and .so files or Linux) along with the minimal source - Wireshark-1.8.3.

1.3 Development Environment for Windows

Following specifications are used for development of the TRDP PD and TRDP MD plug-in for Wireshark.

- Operating System: Windows XP
- Tool : Wireshark V1.8.3
- Programming Language: C
- TRDP Wire Protocol

1.3.1 Steps to compile for Windows

Prerequisites:

- Wireshark minimal source (wireshark-1.8.3.tar.bz2).
- `TRDP-SPY_src.zip` source.
- Follow the online guide `http://www.wireshark.org/docs/wsdg_html_chunked/ChSetupWin32.html`

Steps:

- Unzip `wireshark-1.8.3.tar.bz2` to `c:\` and rename it to `wireshark`.
- Unzip `TRDP-SPY_src.zip`.
- From `TRDP-SPY_src` source copy folders to `c:/wireshark/plugins`.
- Also copy `config.nmake` from `TRDP-SPY` to `c:\wireshark` (overwrite the existing one).
- Open a Terminal and navigate to the plugin location `C:\wireshark\plugins\trpd_spy\`.
- First clean it using command `nmake -f makefile.nmake distclean` or run `clean.bat`.
- Then compile using command `nmake -f makefile.nmake` or run `build.bat`.

This will generate the `TRDP_spy.dll`.

The Wireshark version containing TRDP can be started with:

`C:\wireshark\wireshark-gtk2\wireshark.exe`

1.4 Development Environment for Linux

Following specifications are used for development of the TRDP PD and TRDP MD plug-in for Wireshark.

- Operating System: Ubuntu 12.04 LTS-Linux
- Tool : Wireshark v 1.8.3
- Programming Language: C

1.4.1 Steps to compile and install Wireshark on Linux:

Prerequisites:

- Wireshark source (`wireshark-1.8.3.tar.bz`).
- `TRDP-SPY_src.zip`.

Steps: Unzip wireshark-1.8.3.tar.bz with command on Console and not by using `tar` to unzip:

```
$ tar xjvf Wireshark-1.8.3.tar.bz
```

Now execute the following commands to compile and install Wireshark

```
$ cd wireshark-1.8.3
$ ./configure wireshark-prefix=/opt/local
$ make
$ make install
$ /opt/local/bin/wireshark (to launch Wireshark)
```

Integrate TRDP-SPY into this wireshark version.

Unzip TRDP-SPY.zip. Now copy folder `TRDP_spy` location `wireshark-1.8.3/plugins/` and compile the plugin with the give following commands.

```
$ cd ../wireshark-1.8.3/plugins/trdp_spy
$ make clean
$ make
```

Please refer `wireshark-1.8.3/readme` and `wireshark-1.8.3/install` for more reference.

Chapter 2

Module Index

2.1 Modules

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Data Structure Index

3.1 Data Structures

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4.1 File List

Here is a list of all documented files with brief descriptions:

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Module Documentation

5.1 Parsing

Data Structures

- struct ComId

  This struct makes a mapping between one comId and one dataset.
- struct Dataset

  Description of one dataset.
- struct Element

  description of one element, with a variable that is stored

Functions

- gint trdp_lookupType (GHashTable *pTableDataset, GString *nameOfType)

  Search in the given table at the names and return the found id.
- TRDP_RET_t trdp_parsebody_init (const char **xmlconfigFile)

  Create the module and extract all the needed information from the configuration file.
- void trdp_parsebody_clean (void)

  Clean used memory.
- int trdp_parsebody_isinited (void)

  Show the status, if the library is ready to use.
- struct Dataset * trdp_parsebody_lookup (guint32 comId)

  Looks up the dataset for a given ComId.
- struct Dataset * trdp_parsebody_search (guint32 datasetId)

  Uses the second hashmap to find the struct Dataset for a given datasetid.

Variables

- GString * Element::name

  Name of the variable, that is stored.
- guint32 Element::type

  Numeric type of the variable (see Usermanual, chapter 4.2)
- guint32 Element::array_size

  Amount this value occured.

- GString * Element::unit

  Unit to display.
- gfloat Element::scale

  A factor the given value is scaled.
- gint32 Element::offset

  Offset that is added to the values.

5.1.1 Function Documentation

5.1.1.1 gint trdp_lookupType (GHashTable * *pTableDataset*, GString * *nameOfType*)

Search in the given table at the names and return the found id.

Parameters

in	*pTableDataset*	table containing all types
in	*nameOfType*	textual description of a type, searching for

Returns

found identifier, or zero on errors

5.1.1.2 void trdp_parsebody_clean (void)

Clean used memory.

Release all the allocated memory, needed to store the given information.

Returns

nothing

5.1.1.3 TRDP_RET_t trdp_parsebody_init (const char ** *xmlconfigFile*)

Create the module and extract all the needed information from the configuration file.

Parameters

in	*xmlconfigFile*	path to the file containing the XML description of the TRDP packets.

Returns

TRDP_PARSEBODY_OK when no errors occured

5.1.1.4 int trdp_parsebody_isinited (void)

Show the status, if the library is ready to use.

Returns

> 0 if the library is initialized, 0 if uninitialized

5.1.1.5 struct Dataset * trdp_parsebody_lookup (guint32 *comId*) [read]

Looks up the dataset for a given ComId.

Parameters

in	*comId*	to search for.

Returns

NULL, when nothing was found.

5.1.1.6 struct Dataset * trdp_parsebody_search (guint32 *datasetId*) [read]

Uses the second hashmap to find the struct Dataset for a given datasetid.

Parameters

in	*datasetId*	the dataset we are searching for

Returns

NULL, when nothing was found.

5.1.2 Variable Documentation

5.1.2.1 Element::array_size

Amount this value occured.

1 is default; 0 indicates a dynamic list (the dynamic list starts with a 16bit value with the occurence)

5.1.2.2 Element::offset

Offset that is added to the values.

displayed value = scale * raw value + offset

5.2 Wireshark

Functions

- void proto_register_trdp (void)

  start analyzing TRDP packets
- void proto_reg_handoff_trdp (void)

  Called, if the analysis of TRDP packets is stopped.

5.2.1 Function Documentation

5.2.1.1 void proto_reg_handoff_trdp (void)

Called, if the analysis of TRDP packets is stopped.

If this dissector uses sub-dissector registration add a registration routine. This exact format is required because a script is used to find these routines and create the code that calls these routines.

This function is also called by preferences whenever "Apply" is pressed (see prefs_register_protocol above) so it should accommodate being called more than once.

5.2.1.2 void proto_register_trdp (void)

start analyzing TRDP packets

Register the protocol with Wireshark this format is require because a script is used to build the C function that calls all the protocol registration.

5.3 Definitions

Defines

- #define TRDP_BOOL8 1

  =UINT8, 1 bit relevant (equal to zero -> false, not equal to zero -> true)
- #define TRDP_CHAR8 2

  char, can be used also as UTF8
- #define TRDP_UTF16 3

  Unicode UTF-16 character.
- #define TRDP_INT8 4

  Signed integer, 8 bit.
- #define TRDP_INT16 5

  Signed integer, 16 bit.
- #define TRDP_INT32 6

  Signed integer, 32 bit.
- #define TRDP_INT64 7

  Signed integer, 64 bit.
- #define TRDP_UINT8 8

  Unsigned integer, 8 bit.
- #define TRDP_UINT16 9

  Unsigned integer, 16 bit.
- #define TRDP_UINT32 10

  Unsigned integer, 32 bit.
- #define TRDP_UINT64 11

  Unsigned integer, 64 bit.
- #define TRDP_REAL32 12

  Floating point real, 32 bit.
- #define TRDP_REAL64 13

  Floating point real, 64 bit.
- #define TRDP_TIMEDATE32 14

  32 bit UNIX time
- #define TRDP_TIMEDATE48 15

  48 bit TCN time (32 bit seconds and 16 bit ticks)
- #define TRDP_TIMEDATE64 16

  32 bit seconds and 32 bit microseconds
- #define TRDP_MD_HEADERLENGTH TRDP_HEADER_MD_OFFSET_DATA

  Length of the TRDP header of an MD message.
- #define TRDP_FCS_LENGTH 4

  The CRC calculation results in a 32bit result so 4 bytes are necessary.

Functions

- guint32 trdp_fcs32 (const guint8 buf[], guint32 len, guint32 fcs)

  Calculates and returns a 32-bit FCS.
- guint8 trdp_dissect_width (guint32 type)

  Lookup table for length of the standard types.

5.3.1 Function Documentation

5.3.1.1 guint8 trdp_dissect_width (guint32 *type*)

Lookup table for length of the standard types.

The width of an element in bytes. Extracted from table3 at TCN-TRDP2-D-BOM-011-19.

Parameters

in	*type*	the numeric representation of a type

Returns

the width in byte of one element of the given type

5.3.1.2 guint32 trdp_fcs32 (const guint8 *buf[],* guint32 *len,* guint32 *fcs*)

Calculates and returns a 32-bit FCS.

Parameters

in	*buf*	Input buffer
in	*len*	Length of input buffer
in	*fcs*	Initial (seed) value for the FCS calculation

Returns

Calculated fcs value

Chapter 6

Data Structure Documentation

6.1 ComId Struct Reference

This struct makes a mapping between one comId and one dataset.

`#include <parsebody.h>`

Data Fields

- guint32 comId

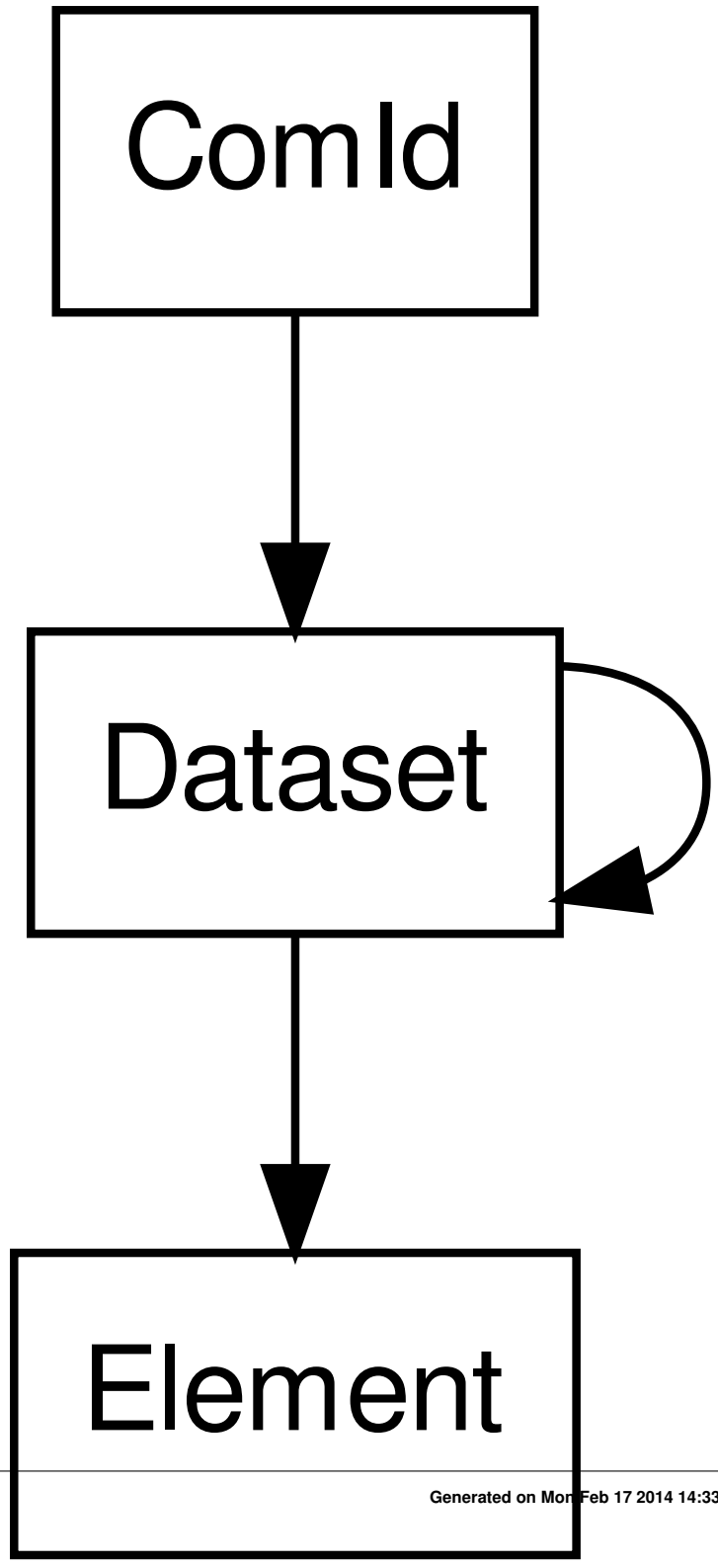
  Communication Id, used as key.

- guint datasetId

  Id for a dataset (see Dataset structure)

6.1.1 Detailed Description

This struct makes a mapping between one comId and one dataset.


ComId
Dataset
Element

This is a separate structure, because there could be mappings from a dataset to another one.

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

- parsebody.h

6.2 Dataset Struct Reference

Description of one dataset.

`#include <parsebody.h>`

Data Fields

- guint datasetId
  Unique identification of one dataset.
- GString * name
  Description of the dataset.
- GSList * listOfElements
  All elements, this dataset consists of.

6.2.1 Detailed Description

Description of one dataset.

6.2.2 Field Documentation

6.2.2.1 GSList* Dataset::listOfElements

All elements, this dataset consists of.

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

- parsebody.h

6.3 Element Struct Reference

description of one element, with a variable that is stored

`#include <parsebody.h>`

Data Fields

- GString * name
  Name of the variable, that is stored.
- guint32 type
  Numeric type of the variable (see Usermanual, chapter 4.2)
- guint32 array_size
  Amount this value occured.

- GString * unit

  Unit to display.
- gfloat scale

  A factor the given value is scaled.
- gint32 offset

  Offset that is added to the values.

6.3.1 Detailed Description

description of one element, with a variable that is stored

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

- parsebody.h

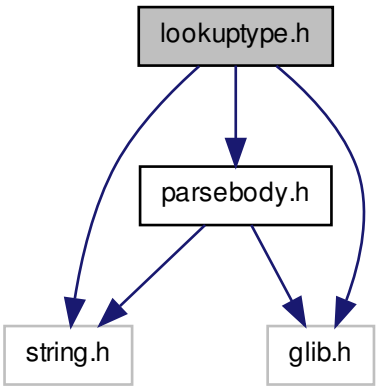
Chapter 7

File Documentation

7.1 lookuptype.h File Reference

Functionality to find the corresponding type id for a name.

`#include <string.h>` `#include <glib.h>` `#include "parsebody.h"` Include dependency graph for lookuptype.h:



Functions

- gint trdp_lookupType (GHashTable *pTableDataset, GString *nameOfType)

  Search in the given table at the names and return the found id.

7.1.1 Detailed Description

Functionality to find the corresponding type id for a name.

Note

Project: TRDP SPY

Author

Florian Weispfenning, Bombardier Transportation

Remarks

Id:

lookuptype.h 1154 2014-01-21 13:11:58Z fweispf

7.2 packet-trdp_spy.h File Reference

Interface between Wireshark and the TRDP anaylsis module.

Functions

- void proto_register_trdp (void)

  start analyzing TRDP packets
- void proto_reg_handoff_trdp (void)

  Called, if the analysis of TRDP packets is stopped.

7.2.1 Detailed Description

Interface between Wireshark and the TRDP anaylsis module.

Note

Project: TRDP SPY

Author

Florian Weispfenning, Bombardier Transportation

Remarks

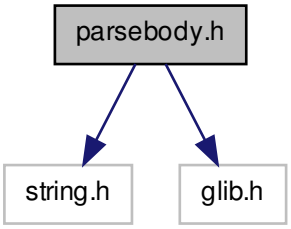
Id:

packet-trdp_spy.h 1161 2014-02-14 13:11:15Z fweispf

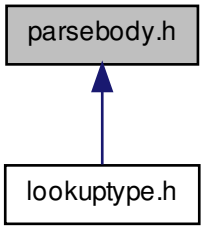
7.3 parsebody.h File Reference

Loading of the XML description.

`#include <string.h>` `#include <glib.h>` Include dependency graph for parsebody.h:



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



Data Structures

- struct ComId

  This struct makes a mapping between one comId and one dataset.
- struct Dataset

  Description of one dataset.
- struct Element

  description of one element, with a variable that is stored

Functions

- TRDP_RET_t trdp_parsebody_init (const char **xmlconfigFile)

  Create the module and extract all the needed information from the configuration file.

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  Clean used memory.
- int trdp_parsebody_isinited (void)

  Show the status, if the library is ready to use.
- struct Dataset * trdp_parsebody_lookup (guint32 comId)

  Looks up the dataset for a given ComId.
- struct Dataset * trdp_parsebody_search (guint32 datasetId)

  Uses the second hashmap to find the struct Dataset for a given datasetid.

7.3.1 Detailed Description

Loading of the XML description.

Note

Project: TRDP SPY

Author

Florian Weispfenning, Bombardier Transportation

Remarks

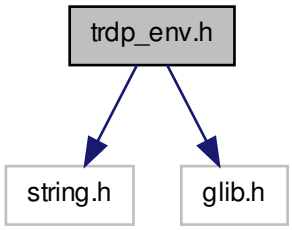
Id:

parsebody.h 1154 2014-01-21 13:11:58Z fweispf

7.4 trdp_env.h File Reference

Definition of the TRDP constants and specific calculations.

`#include <string.h>` `#include <glib.h>` Include dependency graph for trdp_env.h:



Defines

- #define TRDP_BOOL8 1

  =UINT8, 1 bit relevant (equal to zero -> false, not equal to zero -> true)
- #define TRDP_CHAR8 2

  char, can be used also as UTF8
- #define TRDP_UTF16 3

  Unicode UTF-16 character.
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  Signed integer, 64 bit.
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  Unsigned integer, 32 bit.
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  32 bit UNIX time
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  48 bit TCN time (32 bit seconds and 16 bit ticks)
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  Length of the TRDP header of an MD message.
- #define TRDP_FCS_LENGTH 4

  The CRC calculation results in a 32bit result so 4 bytes are necessary.

Functions

- guint32 trdp_fcs32 (const guint8 buf[], guint32 len, guint32 fcs)

  Calculates and returns a 32-bit FCS.
- guint8 trdp_dissect_width (guint32 type)

  Lookup table for length of the standard types.

7.4.1 Detailed Description

Definition of the TRDP constants and specific calculations.

Note

Project: TRDP SPY

Author

Florian Weispfenning, Bombardier Transportation

Remarks

Id: