

Documentation

TwinSAFE User

Tool to modify the User Administration of a TwinSAFE Logic

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BECKHOFF

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1 Foreword

1.1 Notes on the documentation

Intended audience

This description is only intended for the use of trained specialists in control and automation engineering who are familiar with the applicable national standards.

It is essential that the following notes and explanations are followed when installing and commissioning these components.

The responsible staff must ensure that the application or use of the products described satisfy all the requirements for safety, including all the relevant laws, regulations, guidelines and standards.

Origin of the document

This documentation was originally written in German. All other languages are derived from the German original.

Currentness

Please check whether you are using the current and valid version of this document. The current version can be downloaded from the Beckhoff homepage at <http://www.beckhoff.com/english/download/twinsafe.htm>. In case of doubt, please contact Technical [Support](#) [▶ 21].

Product features

Only the product features specified in the current user documentation are valid. Further information given on the product pages of the Beckhoff homepage, in emails or in other publications is not authoritative.

Disclaimer

The documentation has been prepared with care. The products described are subject to cyclical revision. For that reason the documentation is not in every case checked for consistency with performance data, standards or other characteristics. We reserve the right to revise and change the documentation at any time and without prior announcement. No claims for the modification of products that have already been supplied may be made on the basis of the data, diagrams and descriptions in this documentation.

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Delivery conditions

In addition, the general delivery conditions of the company Beckhoff Automation GmbH & Co. KG apply.

1.2 Safety instructions

1.2.1 Delivery state

All the components are supplied in particular hardware and software configurations appropriate for the application. Modifications to hardware or software configurations other than those described in the documentation are not permitted, and nullify the liability of Beckhoff Automation GmbH & Co. KG.

1.2.2 Operator's obligation to exercise diligence

The operator must ensure that

- the TwinSAFE products are only used as intended (see chapter Product description);
- the TwinSAFE products are only operated in sound condition and in working order.
- the TwinSAFE products are operated only by suitably qualified and authorized personnel.
- the personnel is instructed regularly about relevant occupational safety and environmental protection aspects, and is familiar with the operating instructions and in particular the safety instructions contained herein.
- the operating instructions are in good condition and complete, and always available for reference at the location where the TwinSAFE products are used.
- none of the safety and warning notes attached to the TwinSAFE products are removed, and all notes remain legible.

1.2.3 Description of instructions

In these operating instructions the following instructions are used. These instructions must be read carefully and followed without fail!

⚠ DANGER

Serious risk of injury!
Failure to follow this safety instruction directly endangers the life and health of persons.

⚠ WARNING

Risk of injury!
Failure to follow this safety instruction endangers the life and health of persons.

⚠ CAUTION

Personal injuries!
Failure to follow this safety instruction can lead to injuries to persons.

NOTE

Damage to the environment/equipment or data loss
Failure to follow this instruction can lead to environmental damage, equipment damage or data loss.



Tip or pointer

This symbol indicates information that contributes to better understanding.

1.3 Documentation issue status

Version	Comment
1.3.0	<ul style="list-style-type: none"> • Description of target system extended • TwinSAFE User version v7 added
1.2.0	<ul style="list-style-type: none"> • Safety related parameters updated • Confirmation added
1.1.0	<ul style="list-style-type: none"> • Note to login behavior added
1.0.0	<ul style="list-style-type: none"> • First released version
0.0.1	<ul style="list-style-type: none"> • First draft

2 System description

2.1 General

The tool TwinSAFE User is a software for creating and modifying a user on a TwinSAFE logic component independently of the TwinCAT development environment.

2.2 System limits

The software TwinSAFE User is delivered as an executable program library and is available for the operating systems Windows and Linux. This library can be integrated into applications. The various functions of the program library are controlled via appropriate command line options.

2.3 Overview

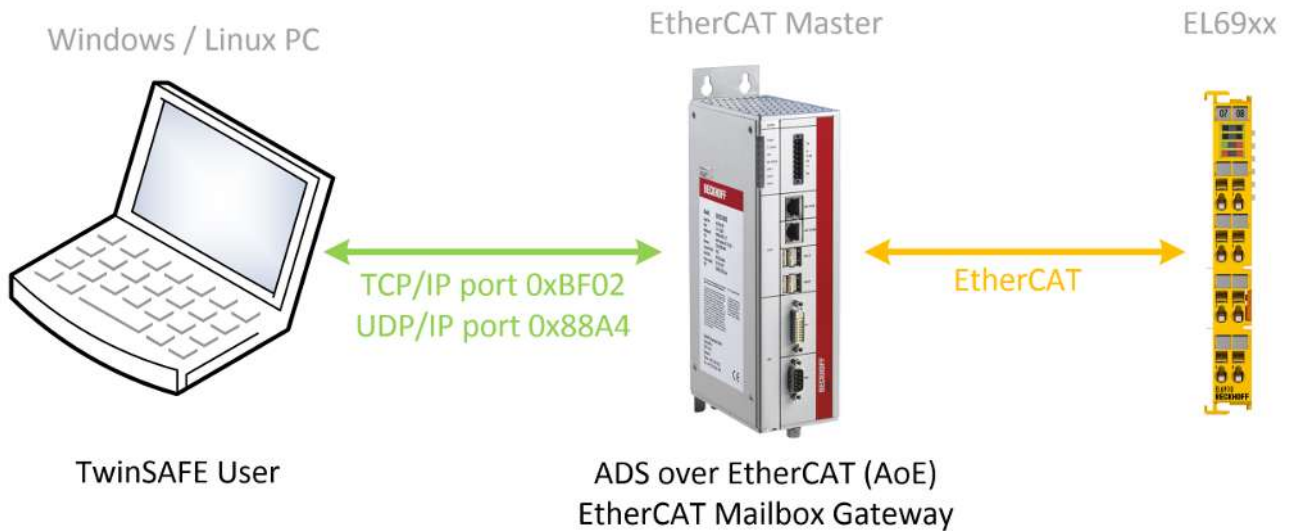


Fig. 1: TwinSAFE User Overview

3 Product description

3.1 System requirements

3.1.1 Operating System

To run the TwinSAFE User, the following system requirements must be met depending on the operating system.

3.1.1.1 Windows

No additional components are required for the operating system Windows 7 (32 bit).

The following table lists the different versions of the TwinSAFE User and the associated SHA checksums.

File name	Operating system	Version	SHA Checksum
TwinSAFE_User.exe	Win32	v5	SHA256: 8438b34b49e9149ba8ef0c6e06d3eb7b9820ecd9cc a57ceb3893a6e8bbd90eda
		v7	SHA256: 157942661273d1005cf89b41d2908b51b835d9543f 0d3e7a75a2baa7fcb12f9d

3.1.1.2 Linux

No additional components are required for the operating system Ubuntu 16.04.

The following table lists the different versions of the TwinSAFE User and the associated SHA checksums.

Filename	Operating system	Version	SHA Checksum
TwinSAFE_User.bin	Linux x86 64-Bit	v5	SHA256: 6365b18031705581519aef65e50c4af2a50a7987cc 3a97d5fbd8278036a5dc76
		v7	SHA256: 493977c42d42fb2bb482657c1b2b0af16cb26fb450f 4e2db42a60df0b8dd4493
TwinSAFE_User-i386.bin	Linux x86 32-Bit	v5	SHA256: d5a9d7971611f39107430862741280e1389ed22b32 d34a1c118887237170b731
		v7	SHA256: 5866d701d12a7ab500a922f8b42c1210cde023bb06 67e6ba6fd30579ab4a1222

3.1.2 Target system

The supported TwinSAFE logic components can be taken from the following list:

Product name	SW version
EL6900	05 or newer (Production from week 02/2014) The argument of the command line parameter newmode is always specified here with 0x7C, because the extended user rights management does not exist on the EL6900. This value corresponds to the user rights on the EL6900.
EL6910	01 or newer
EK1960	01 or newer
EL1918	01 or newer
EL2911	01 or newer
EP1957-0022	01 or newer
EJ6910	01 or newer
EJ1914	01 or newer
EJ1918	01 or newer
EJ2914	01 or newer
EJ2918	01 or newer
EJ1957	01 or newer

The components listed in the table above are directly supported in the current version of the TwinSAFE User.

NOTE

Integration of new TwinSAFE logic components

If a new TwinSAFE logic component is available which is not directly supported in the current version of the TwinSAFE User, it can be included by an additional configuration file.

To integrate a new TwinSAFE logic component, an additional file "custom_terminals.csv" must be created in the directory of the TwinSAFE User execution file. This file can then be filled in the following syntax so that new components can be supported (lines 1 and 2 are fixed). Using the example of a new logic component ELxxxx, which is based on the TwinSAFE Logic EL6910, the file would have to be extended as shown in line 5.

File: custom_terminals.csv

```
1
class;type
EL6910;EL6910
EL6910;EP1957-0022
EL6910;ELxxxx
```

Furthermore, an updated version of this configuration file can always be found on the Beckhoff website when new components are introduced without direct support from the TwinSAFE User.

3.1.3 Communication with the TwinSAFE logic component

The software TwinSAFE User supports the following protocols for modifying the user administration on a TwinSAFE logic component.

- ADS over EtherCAT (AoE)
- EtherCAT Mailbox Gateway

For successful communication with the TwinSAFE logic component, the TwinSAFE User must be able to establish a connection with the EtherCAT master existing in the system. The following system requirements must be fulfilled for this:

3.1.3.1 ADS over EtherCAT (AoE)

The EtherCAT master must be configured so that it accepts AoE connections (according to ETG.1020) on port 0xBF02 (TCP/IP).

3.1.3.2 EtherCAT Mailbox Gateway

The EtherCAT master must be configured so that it accepts packets of the EtherCAT mailbox gateway (according to ETG.8200) on port 0x88A4 (UDP/IP).

3.2 Intended use

WARNING

Risk of injury!

Using the tool TwinSAFE-User beyond the intended use described below is not permitted!

CAUTION

Follow the machinery directive!

The TwinSAFE terminals may only be used in machines according to the machinery directive.

WARNING

Creating and customizing the user administration - Authentication!

The user must ensure that only authorized persons are able to create or adapt the user administration.

WARNING

Execution of the safety application

When creating or changing a user, a login is performed on the TwinSAFE logic component. During this login, the execution of the current safety project on the TwinSAFE logic is stopped.

3.3 Functioning

The tool TwinSAFE User is used to create, delete or modify a user on a TwinSAFE logic component independently from the TwinCAT development environment.

The necessary data packets are transferred to the corresponding component via the existing EtherCAT master in the system. The functions of the TwinSAFE User are controlled via command line parameters.

3.3.1 Communication

The following parameters must be used to control communication.

Command line parameters	Description
--gw <IPv4 address>	Specification of the IPv4 address of the EtherCAT mailbox gateway or, in AoE mode, the IPv4 address of the EtherCAT master. As of version v5, the EtherCAT master can also be addressed via the host name in AoE mode.
--ams <NetId>	Specification of the AmsNetID, if ADS over EtherCAT (AoE) is to be used.
--localams <NetId>	if --ams is used the local AMSNetID can be specified. If the parameter is not used, the AmsNetID is formed from its own IP address + ".1.1".

3.3.2 Authentication

The following parameters must be used to authenticate a user on the TwinSAFE logic.

Command line parameters	Description
--user <user name>	Name of the user with the appropriate rights to perform the desired function.
--pass <password>	Password of the user.



User management

Each TwinSAFE logic component has its own user administration. Only users registered in the TwinSAFE logic component can perform certain functions.

3.3.3 EtherCAT slave address

In order to be able to uniquely identify the TwinSAFE logic component, the EtherCAT slave address must be specified.

Command line parameters	Description
--slave <EtherCAT address of the EtherCAT slave>	Specification of the EtherCAT slave address of the TwinSAFE logic component.

3.3.4 Reading the user administration

The *list* command can be used to read out the user management currently available on the TwinSAFE logic component. For this, the command line parameters --gw/--ams and --slave must be specified together with --list.

Command line parameters	Description
--list <*.csv file>	Retrieving the list of all users existing on the TwinSAFE logic

Example

```
C:\>TwinSAFE_User.exe --gw 192.168.1.253 --slave 1001 --list output.csv
```

Structure of the csv format

The first line contains the version number of the used csv format and the second line the headings separated by a semicolon. In the next lines follows the respective user ID and the user separated by semicolons.

```
1
id;username
1;Administrator
2;JohnDoe
```

3.3.5 Add new user

A new user is added, in addition to the parameters described above, the --newuser, --newpass and --newmode parameters are specified.

Command line parameters	Description
--newuser <user name>	Username of the new user
--newpass <user password>	Password of the new user
--newmode <user rights>	User rights of the new user (given as 32-bit value in hexadecimal representation e.g. 0x0000007C) see also List of all available parameters [► 14]

Example

```
C:\>TwinSAFE_User.exe --gw 192.168.1.253 --user Administrator --pass TwinSAFE --slave 1001 --newuser JohnDoe --newpass TwinCAT --newmode 0x7C
```

3.3.6 Delete user

A new user is deleted, in which only the --newuser parameter is specified in addition to the parameters described above.

Command line parameters	Description
--newuser <user name>	Username of the user to be deleted
--newpass <>	must not be specified
--newmode <>	must not be specified

Example

```
C:\>TwinSAFE_User.exe --gw 192.168.1.253 --user Administrator --pass TwinSAFE --slave 1001 --newuser JohnDoe
```

3.3.7 Change user password

A user password is changed in which the parameters --newuser and --newpass are specified in addition to the parameters described above.

Command line parameters	Description
--newuser <user name>	Username of the user
--newpass <user password>	New password of the user
--newmode <>	must not be specified

Example

```
C:\>TwinSAFE_User.exe --gw 192.168.1.253 --user Administrator --pass TwinSAFE --slave 1001 --newuser JohnDoe --newpass TwinSAFE
```

3.3.8 Change user rights

The user rights are changed by specifying the `--newuser` and `--newmode` parameters in addition to the parameters described above.

Command line parameters	Description
<code>--newuser <user name></code>	Username of the user
<code>--newpass <></code>	must not be specified
<code>--newmode <user rights></code>	New rights of the user (given as 32-bit value in hexadecimal representation e.g. 0x0000007C) see also List of all available parameters [► 14]

Example

```
C:\>TwinSAFE_User.exe --gw 192.168.1.253 --user Administrator --pass TwinSAFE --slave 1001 --newuser
JohnDoe --newmode 0x78
```

3.4 List of all available parameters

Command line parameters	Description
<code>--help</code>	Shows the help screen
<code>--gw <IPv4 address></code>	Specification of the IPv4 address of the EtherCAT mailbox gateway or, in AoE mode, the IPv4 address of the EtherCAT master.
<code>--ams <NetId></code>	Specification of the AmsNetID, if ADS over EtherCAT (AoE) is to be used.
<code>--localams <local AMS Net ID></code>	When using <code>--ams</code> , the local AMSNetID can be specified. If the parameter is not used, the AmsNetID is formed from its own IP address + ".1.1".
<code>--user <user name></code>	User name. Typically this is the user Administrator.
<code>--pass <password></code>	Password of the Administrator.
<code>--slave <EtherCAT address of the EtherCAT slave></code>	Specification of the EtherCAT slave address of the TwinSAFE logic component.
<code>--list <file name></code>	Together with command parameters <code>gw</code> and <code>slave</code> : Saves the user administration list as a CSV list to the specified file.
<code>--newuser <user name></code>	User name of the user to be created or modified.
<code>--newpass <user password></code>	Password of the user to be created or modified.
<code>--newmode <user rights></code>	User rights (indicated as 32-bit value in hex representation, for example, 0x0000007C - see the following table)

Arguments of the command `--newmode`

The following table contains information about the individual user rights and their bit offset within the 32-bit value used with the `--newmode` command..

Bit offset	User right
0	reserved (0)
1	Creating or modifying a user
2	Changing the user password
3	Download of the TwinSAFE logic program
4	Download of the TwinSAFE logic mapping data
5	Download of the TwinSAFE logic parameter data
6	Download of the TwinSAFE logic info data
7	reserved (0)
8-15	reserved (0)
16	Customizing of TwinSAFE groups
17-31	reserved (0)

i **EL6900**

For the EL6900, the argument of the command line parameter --newmode must always be specified as 0x7C. This corresponds to the user rights that an EL6900 user has.

3.5 Safety parameters

The tool TwinSAFE User is not safety relevant. It is classified as "T1" according to IEC 61508-3 / IEC 61131-6 as it does not generate outputs that directly or indirectly contribute to the executable code (including data) of the safety related system.

3.6 Error codes

The product has the following error codes.

Error code	Meaning	Possible cause
0x0000	No error	Action successfully carried out
0x0001	Invalid parameter	Command-line parameter was incorrect
0x0002	File does not exist or is corrupted	Project file is corrupted or the specified path is invalid
0x0003	Login failed	The specified user name or password is invalid on the logic terminal
0x0004	Unknown EtherCAT slave	No slave could be found for the specified EtherCAT address
0x0005	Error during the data transmission	The communication connection was disconnected

4 EtherCAT Mailbox Gateway

The EtherCAT Mailbox Gateway is required to access TwinSAFE logic components when ADS cannot be used for communication.

The following description shows which settings must be made by way of example in order to be able to communicate via the EtherCAT Mailbox Gateway.

The configuration for using the EtherCAT Mailbox Gateway consists of a TwinSAFE Loader PC on which the TwinSAFE Loader is installed and a TwinCAT PC which serves as a gateway to route the requests from the TwinSAFE Loader PC to the EtherCAT network and to the TwinSAFE logic components.

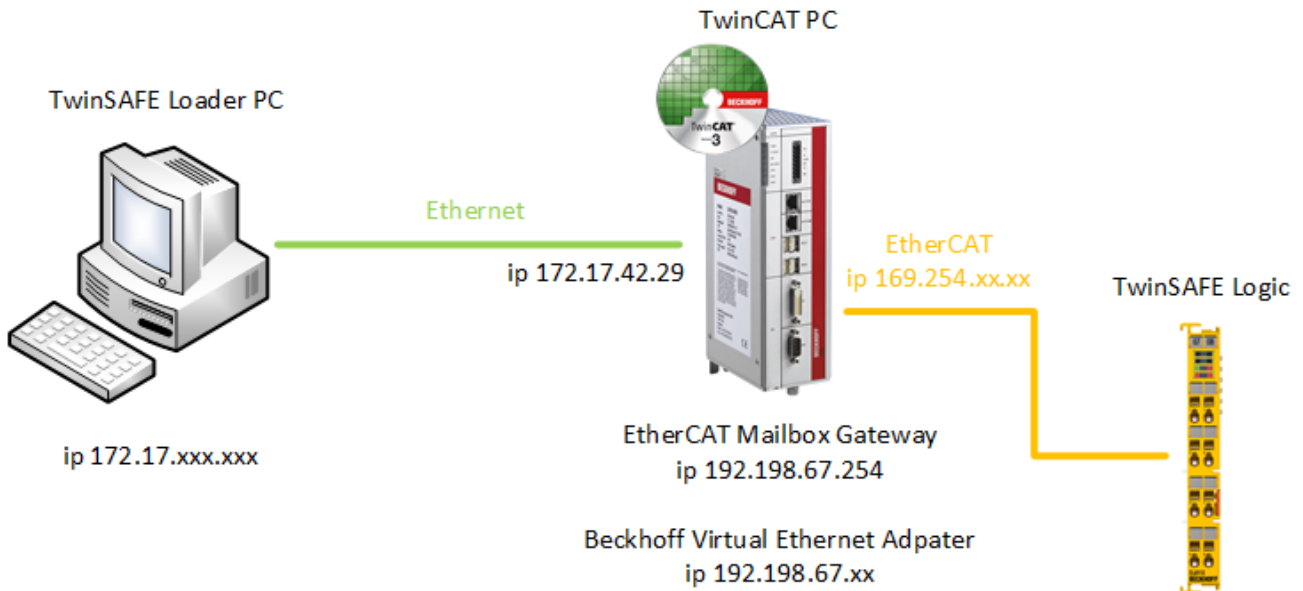


Fig. 2: EtherCAT Mailbox Gateway

4.1 Settings EtherCAT Mailbox Gateway

Activation of the EtherCAT Mailbox Gateway is performed via the advanced settings of the EtherCAT master. These can be found under the EtherCAT tab when the EtherCAT master is selected in the TwinCAT tree structure.

The settings for the EtherCAT Mailbox Gateway are summarized under the entry EoE Support. The Virtual Ethernet Switch, Connect to TCP / IP Stack, and IP Enable Router must be enabled. In addition, the EtherCAT Mailbox Gateway must be activated and an IP address outside the existing networks must be selected. These settings require a restart of the TwinCAT PC.

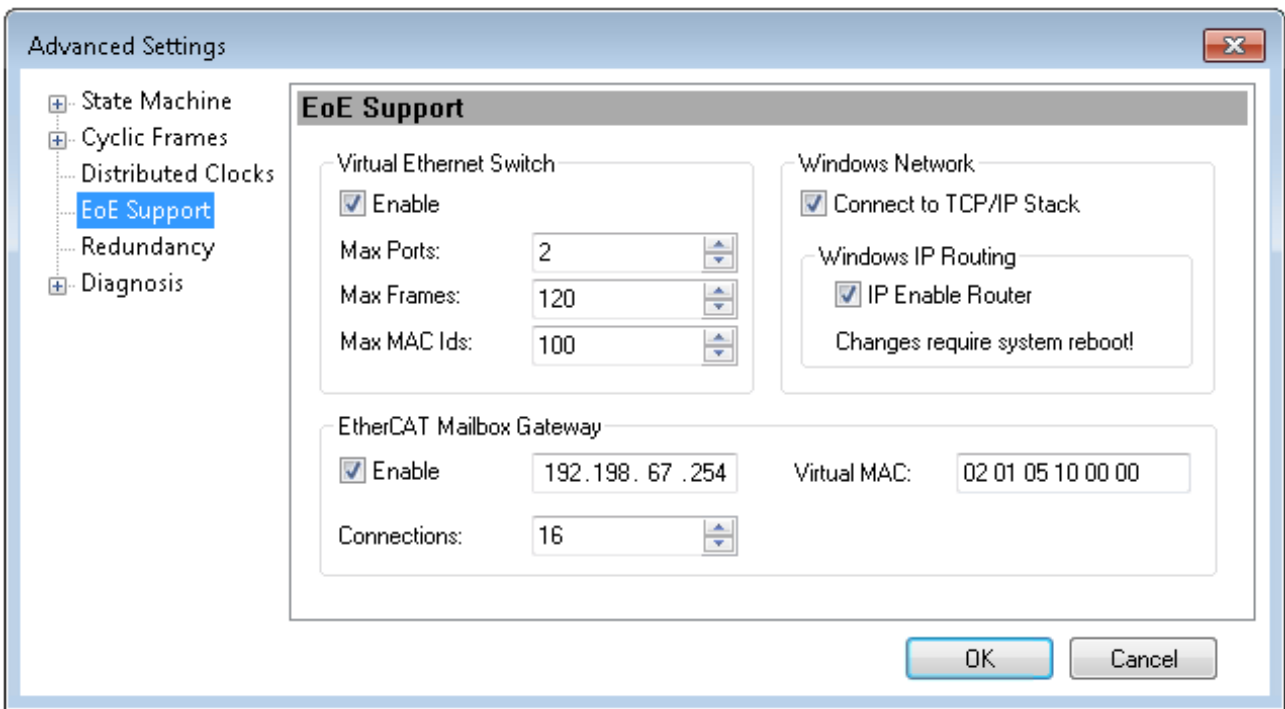


Fig. 3: EoE Support

Whether these settings are correct should be checked locally with the ping command on the TwinCAT computer. In this case, the command would read as follows:

```
ping 192.198.67.254
```

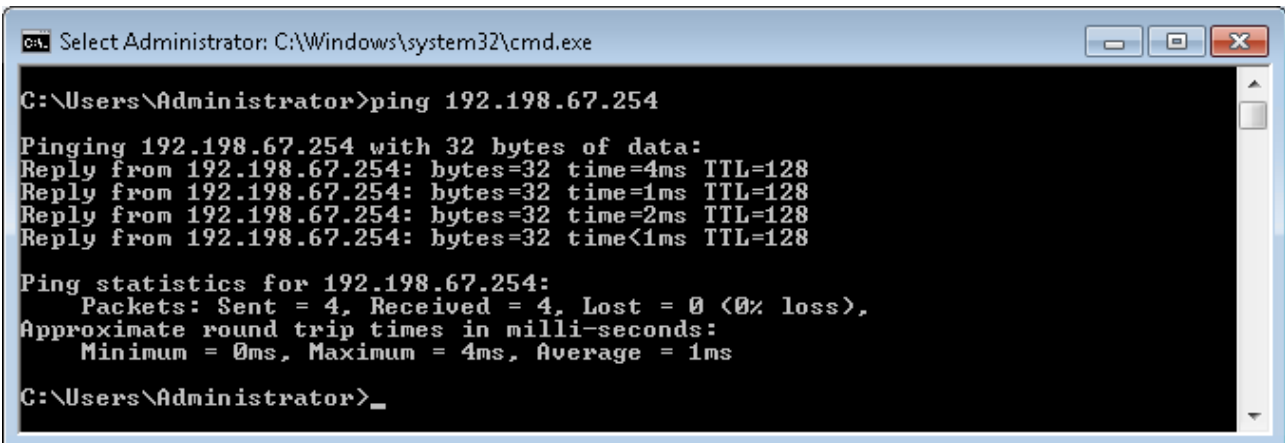


Fig. 4: The command ping 192.198.67.254

4.2 Beckhoff Virtual Ethernet Adapter

If the ping command has not yet delivered a positive result, it may be that the Beckhoff Virtual Ethernet Adapter has yet to be configured.

To do this, open the network settings and select the Properties via the context menu of the Beckhoff Virtual Ethernet Adapter.

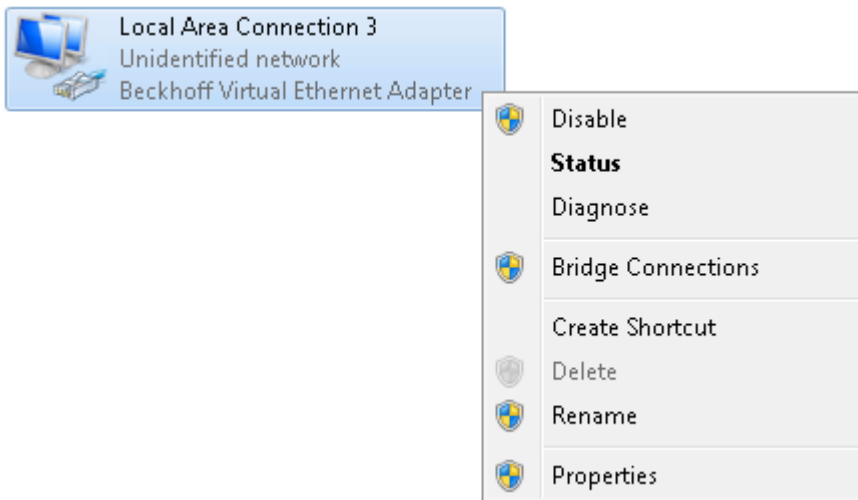


Fig. 5: Network settings - context menu of the Beckhoff virtual Ethernet adapter

Beckhoff Virtual Ethernet Adapter

i If there is no Virtual Ethernet adapter in the system listed, an EoE device (e.g. EL6601) can be added under TwinCAT. Under the Extended EtherCAT settings of this device, under EoE the Virtual Ethernet port can be activated.

In the properties of this network adapter, you set a fixed IP address that is within the network area of the EtherCAT Mailbox Gateway. In the example, this is the IP address 192.198.67.13 with the subnet mask 255.255.255.0.

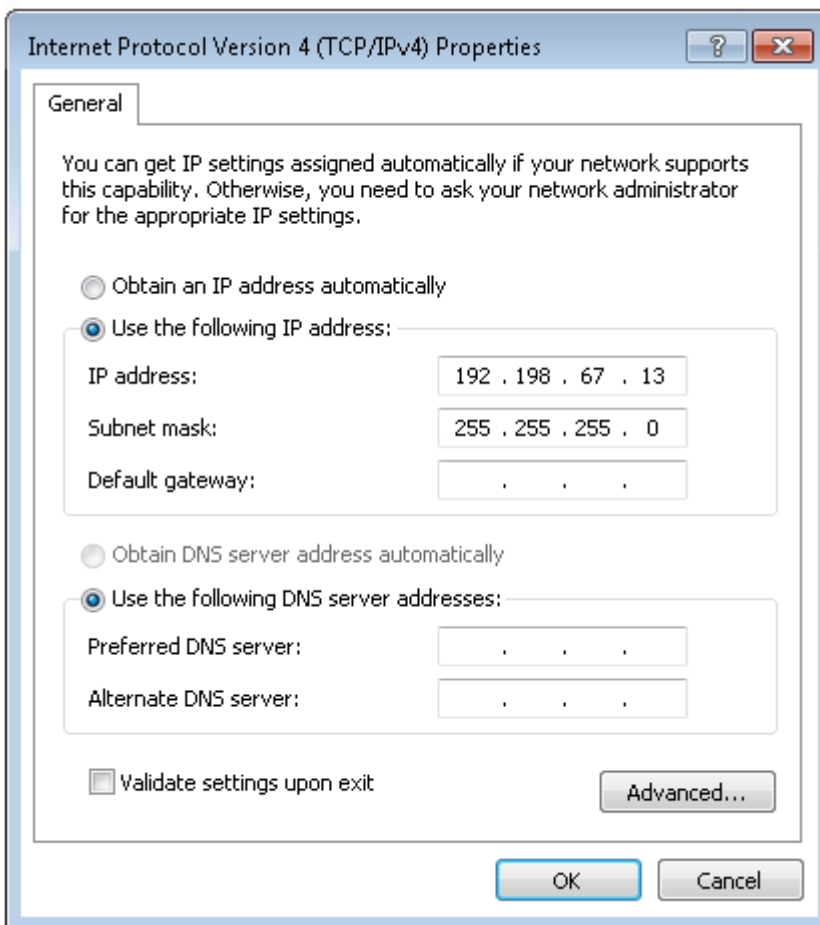


Fig. 6: Properties of the Beckhoff virtual Ethernet adapter

Whether this setting is correct should be checked again with the ping command locally on the TwinCAT computer. The command would again be as follows:

```
ping 192.198.67.254
```

4.3 Adding a route

After all settings on the TwinCAT PC have been carried out and the local execution of the ping command has been successful, an IP route has to be added to the TwinSAFE Loader PC.

The route is added by command `route add` from the command line.

The command prompt to add a route must be started as an administrator.

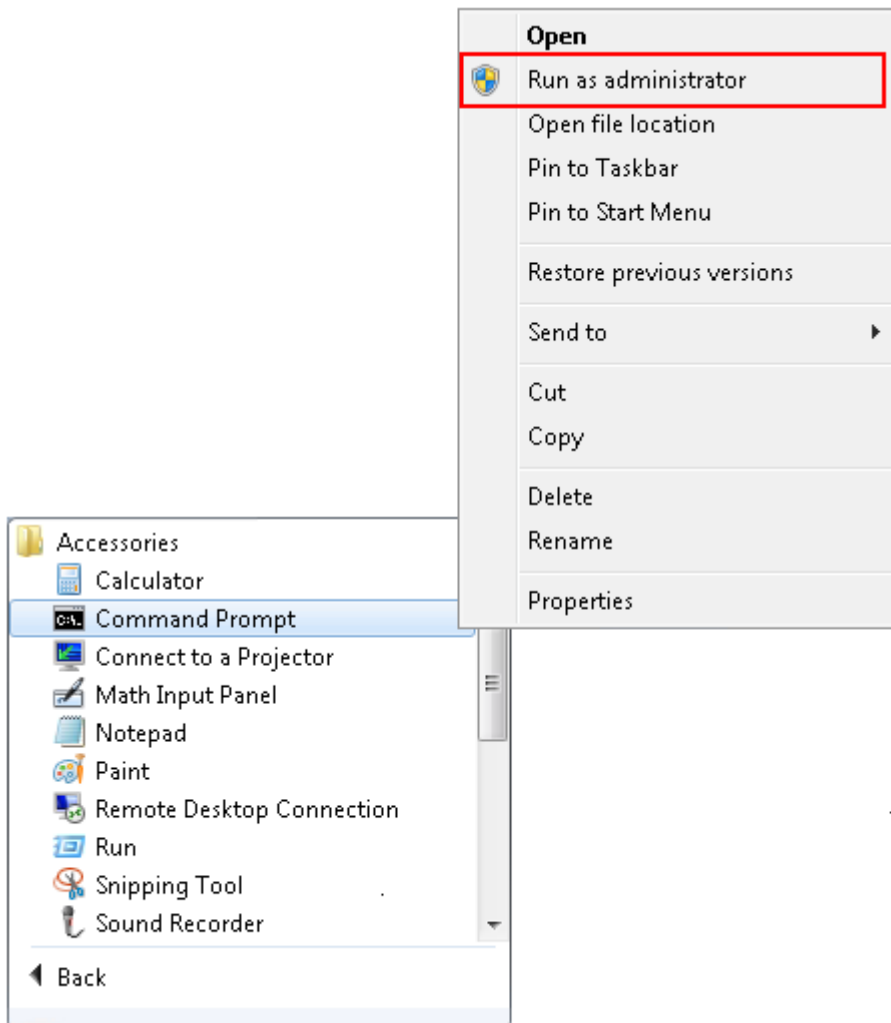


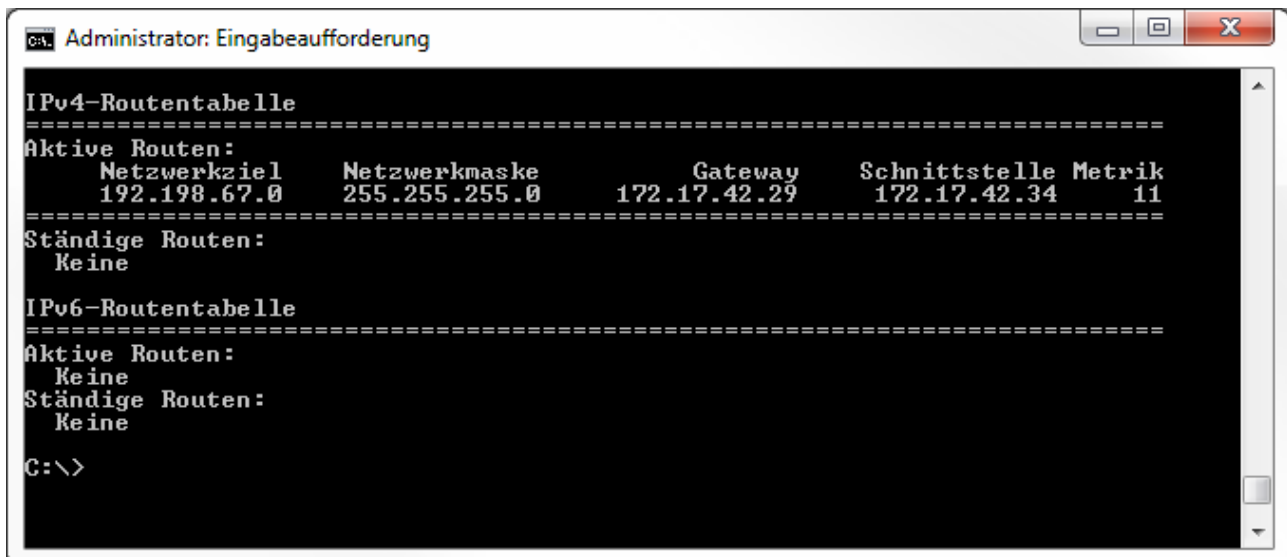
Fig. 7: Start the Windows command prompt as administrator

The route is then added using the following command:

```
route add 192.198.67.0 mask 255.255.255.0 172.17.42.29
```

The command returns an OK! when adding the route was successful.

The current routes can be displayed using the `route print 192.198.*` command.



```
C:\ Administrator: Eingabeaufforderung

IPv4-Routentabelle
=====
Aktive Routen:
  Netzwerkziel   Netzwerkmaske   Gateway   Schnittstelle   Metrik
  192.198.67.0   255.255.255.0   172.17.42.29   172.17.42.34   11
=====
Ständige Routen:
  Keine

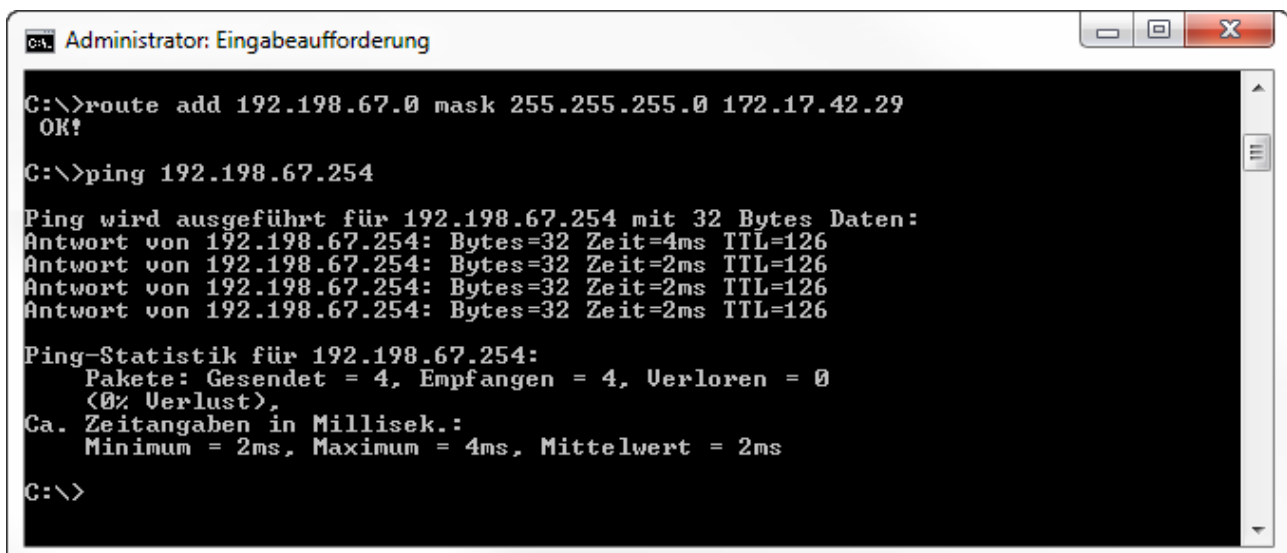
IPv6-Routentabelle
=====
Aktive Routen:
  Keine
Ständige Routen:
  Keine

C:\>
```

Fig. 8: Windows command prompt

To check the function, a ping command should now be sent from the TwinSAFE Loader PC to the EtherCAT Mailbox Gateway.

```
ping 192.198.67.254
```



```
C:\ Administrator: Eingabeaufforderung

C:\>route add 192.198.67.0 mask 255.255.255.0 172.17.42.29
OK!

C:\>ping 192.198.67.254

Ping wird ausgeführt für 192.198.67.254 mit 32 Bytes Daten:
Antwort von 192.198.67.254: Bytes=32 Zeit=4ms TTL=126
Antwort von 192.198.67.254: Bytes=32 Zeit=2ms TTL=126
Antwort von 192.198.67.254: Bytes=32 Zeit=2ms TTL=126
Antwort von 192.198.67.254: Bytes=32 Zeit=2ms TTL=126

Ping-Statistik für 192.198.67.254:
  Pakete: Gesendet = 4, Empfangen = 4, Verloren = 0
  (0% Verlust),
  Ca. Zeitangaben in Millisek.:
    Minimum = 2ms, Maximum = 4ms, Mittelwert = 2ms

C:\>
```

Fig. 9: Windows command prompt - command ping 192.198.67.254

If the ping command returns a positive result, the EtherCAT Mailbox Gateway can also be used with the TwinSAFE Loader.

5 Appendix

5.1 Support and Service

Beckhoff and their partners around the world offer comprehensive support and service, making available fast and competent assistance with all questions related to Beckhoff products and system solutions.

Beckhoff's branch offices and representatives

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The addresses of Beckhoff's branch offices and representatives round the world can be found on her internet pages:

<http://www.beckhoff.com>

You will also find further [documentation](#) for Beckhoff components there.

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- repair service
- spare parts service
- hotline service

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Fax: +49 5246 963 479
e-mail: service@beckhoff.com

5.2 Confirmation



KONFORMITÄTSBESTÄTIGUNG LETTER OF CONFIRMATION

TwinSAFE User

Hersteller:

Manufacturer:

Beckhoff Automation GmbH & Co. KG

Hülshorstweg 20
D-33415 Verl

Prüf- und Zertifizierungsstelle:

Test- and certification body:

TÜV SÜD RAIL GmbH
Rail Automation
Barthstraße 16
D-80339 München

1. Allgemein / General

TwinSAFE User ist ein PC-basiertes Tool, um einen Benutzer auf einer TwinSAFE Logik-Komponente unabhängig von der Entwicklungsumgebung TwinCAT anzulegen, zu löschen oder zu verändern. Die dafür nötigen Datenpakete werden über den im System vorhandenen EtherCAT-Master an die entsprechende Komponente übertragen. Die Funktionen des TwinSAFE User werden über Kommandozeilenparameter gesteuert.

TwinSAFE User is a PC-based tool to create, edit or delete a user on a TwinSAFE logic component independent from the development environment TwinCAT. The required data packages are transferred to the relevant components over the EtherCAT master, which is available in the system. The functionalities of TwinSAFE User are controlled by command line parameters.

Version / Version

TwinSAFE User Version v7:

- **Linux x86 64-Bit** (TwinSAFE_User.bin):
SHA256: 493977c42d42fb2bb482657c1b2b0af16cb26fb450f4e2db42a60df0b8dd4493
- **Linux x86 32-Bit** (TwinSAFE_User-i386.bin):
SHA256: 5866d701d12a7ab500a922f8b42c1210cde023bb0667e6ba6fd30579ab4a1222
- **Win32** (TwinSAFE_user.exe):
SHA256: 157942661273d1005cf89b41d2908b51b835d9543f0d3e7a75a2baa7fcb12f9d

2. Prüfgrundlagen / Test bases

- EN 61508-1: 2010
- EN 61508-3: 2010 (Offline-Softwarewerkzeug Klasse T1 / software off-line support tool class T1)

3. Zusammenfassung / Summary

Gegen den Einsatz des Tools **TwinSAFE User** der Fa. Beckhoff Automation GmbH & Co. KG sprechen von Seiten TÜV SÜD Rail GmbH, Rail Automation, keine sicherheitstechnischen Bedenken.

TÜV SÜD Rail GmbH, Rail Automation, has no doubts as to the safety-related issues of the use of the tool **TwinSAFE User**.

TÜV SÜD Rail GmbH
July 19th, 2019

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Dieser Bericht wurde auf Grundlage einer TÜV-internen technischen Beurteilung erstellt.
Dieser enthält das Ergebnis einer einmaligen Untersuchung an dem zur Prüfung vorgelegten Erzeugnis.

This Report was create on basis of a TÜV internal Review Report. It includes the result of a previous examination of the product submitted for examination.

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