acontis technologies GmbH

SOFTWARE

Hypervisor-RTOS-32-Remote-Debug-Guide

acontis Real-time Hypervisor and RTOS-32 Remote Debug

Version 9.x

Edition: July 29, 2025

Table of Contents

1 Step by Step Hypervisor Host and RTOS-32 Configuration with System Manager and Shell Scripts

1.1 Introduction

It is recommended to carry out the steps in *the order described* so that you get the remote debugging running. Steps, which are marked with `<optional>`, can be skipped.

Important: The steps are grouped in parts **A-E** over Hypervisor Host and RTOS-32. Each part **depends** on the previous part!

On the development PC our classic EC-Win(RTOS-32) is used. On the Hypervisor Host the steps must be done by the shell and/or supplied shell scripts.

1.2 Default values:

This tutorial assumes the following default values. Adjust it accordingly to your needs in the places of occurrence.

- `$Target_HV_IP$ = 172.17.10.53` - IP address of Hypervisor Host network adapter **and** the bridge.
- `$Target_IP$ = 172.17.10.5` - Remote IP address of the RTOS part.
- `\\172.17.10.53\debug` - Default network share (adjust share name `'debug'` at `/etc/samba/smb.conf` if needed)
- `enp2s0` default name of the Hypervisor Host network adapter.

1.3 Prerequisites

- EC-Win(RTOS-32) 7.1 or newer
- acontis Hypervisor package
- Development PC
- Hypervisor Host (PC/IPC)
- Visual Studio (2005-2019) with C/C++ workload

On Development PC: Visual Studio + EC-Win(RTOS-32)

On Hypervisor Host (PC/IPC): installed acontis Hypervisor package

2 Part A - Development PC Configuration

- Start the System Manager

Hint: If it's the first launch of the System Manager a dialog to enter a workspace directory opens.

- Select **My Computer** node on the tree view and add an RTOS to the configuration.

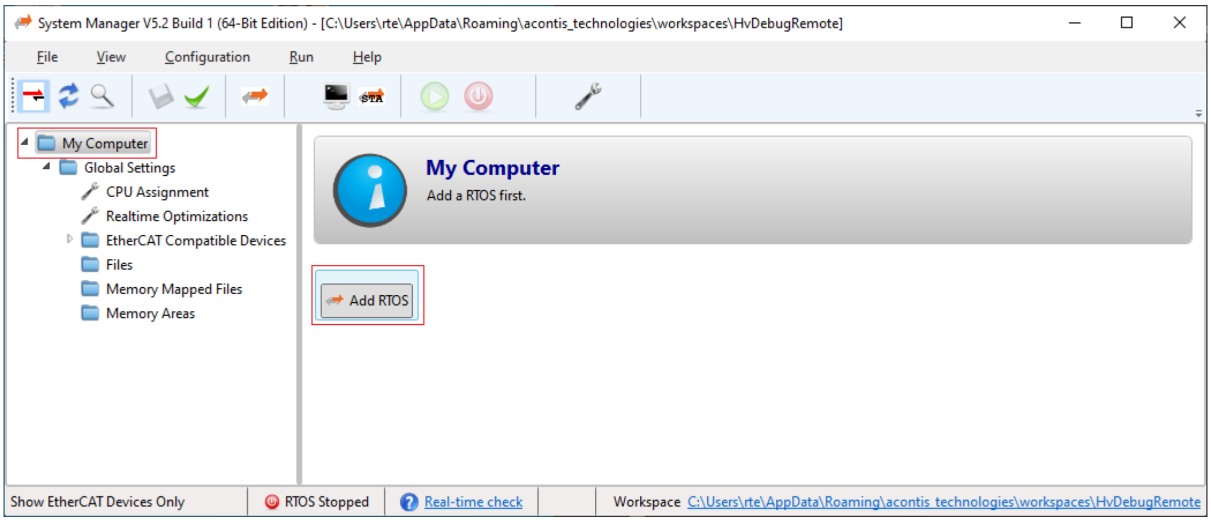

System Manager V5.2 Build 1 (64-Bit Edition) - [C:\Users\rte\AppData\Roaming\acontis_technologies\workspaces\HvDebugRemote]
File
View
Configuration
Run
Help
My Computer
Global Settings
CPU Assignment
Realtime Optimizations
EtherCAT Compatible Devices
Files
Memory Mapped Files
Memory Areas
My Computer
Add a RTOS first.
Add RTOS
Show EtherCAT Devices Only
RTOS Stopped
Real-time check
Workspace C:\Users\rte\AppData\Roaming\acontis_technologies\workspaces\HvDebugRemote

Fig. 2.1: Select Rtos in SysMgr.

- Select the `Application` node of the `RTOS #1` section and push the `Create New Application Project (Debug Only)` button.

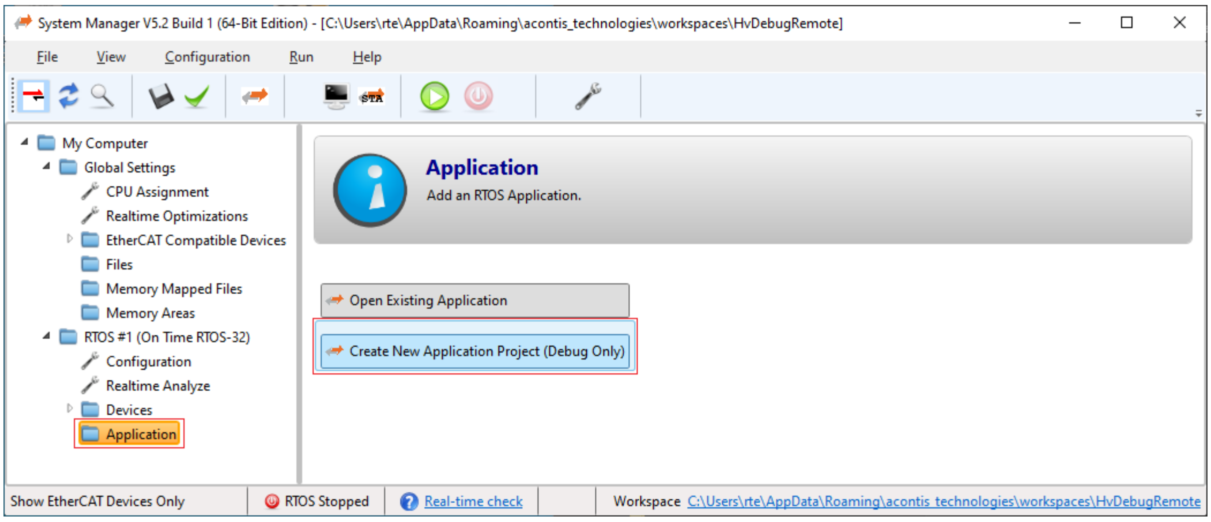
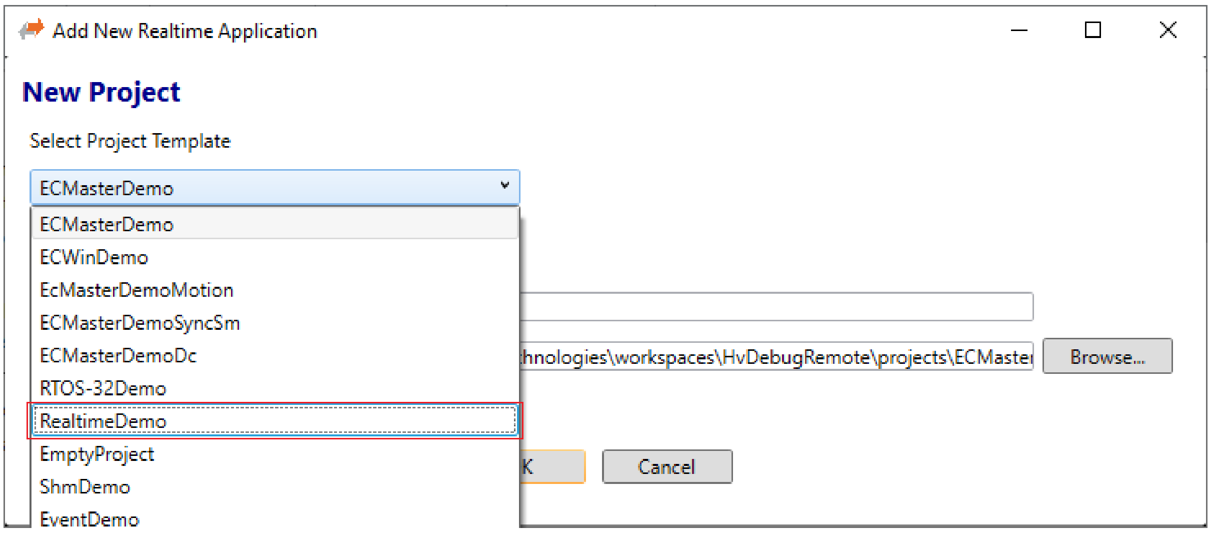

System Manager V5.2 Build 1 (64-Bit Edition) - [C:\Users\rte\AppData\Roaming\acontis_technologies\workspaces\HvDebugRemote]
File
View
Configuration
Run
Help
My Computer
Global Settings
CPU Assignment
Realtime Optimizations
EtherCAT Compatible Devices
Files
Memory Mapped Files
Memory Areas
RTOS #1 (On Time RTOS-32)
Configuration
Realtime Analyze
Devices
Application
Application
Add an RTOS Application.
Open Existing Application
Create New Application Project (Debug Only)
Show EtherCAT Devices Only
RTOS Stopped
Real-time check
Workspace C:\Users\rte\AppData\Roaming\acontis_technologies\workspaces\HvDebugRemote

Fig. 2.2: Select source application in SysMgr.

- Select for example RealtimeDemo and push `OK` button.


Add New Realtime Application

New Project

Select Project Template

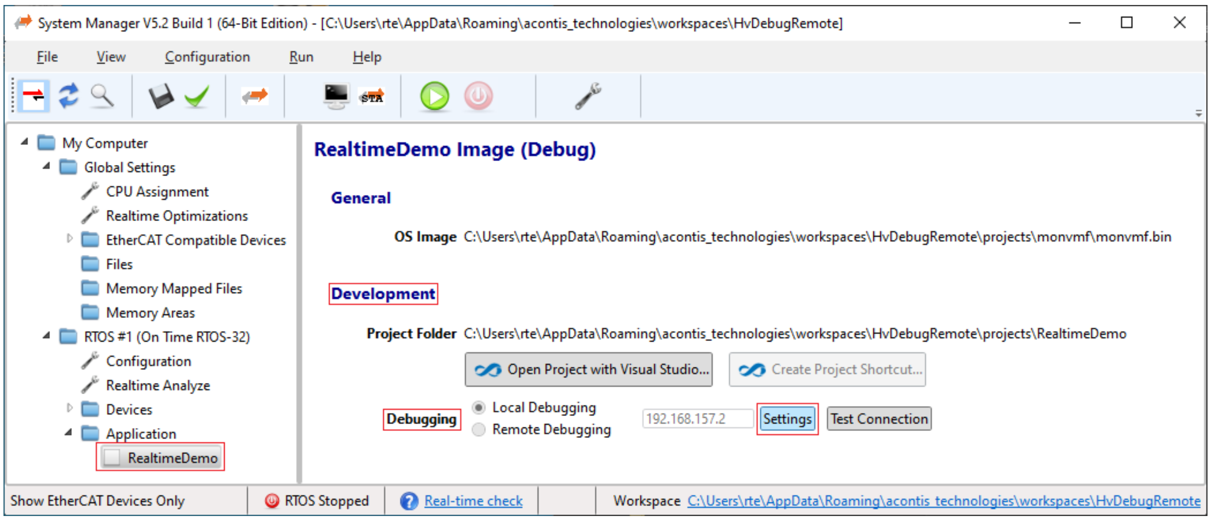
ECMasterDemo

- ECMasterDemo
- ECWinDemo
- EcMasterDemoMotion
- ECMasterDemoSyncSm
- ECMasterDemoDc
- RTOS-32Demo
- RealtimeDemo
- EmptyProject
- ShmDemo
- EventDemo

hnologies\workspaces\HvDebugRemote\projects\ECMaste

Fig. 2.3: Select for example RealtimeDemo as source application in SysMgr.

- Scroll to `<Development|Debugging>` section and push the `Settings` button.


System Manager V5.2 Build 1 (64-Bit Edition) - [C:\Users\rte\AppData\Roaming\acontis_technologies\workspaces\HvDebugRemote]

- My Computer
  - Global Settings
    - CPU Assignment
    - Realtime Optimizations
    - EtherCAT Compatible Devices
    - Files
    - Memory Mapped Files
    - Memory Areas
  - RTOS #1 (On Time RTOS-32)
    - Configuration
    - Realtime Analyze
    - Devices
    - Application
      - RealtimeDemo

RealtimeDemo Image (Debug)

General

OS Image C:\Users\rte\AppData\Roaming\acontis_technologies\workspaces\HvDebugRemote\projects\monvmf\monvmf.bin

Development

Project Folder C:\Users\rte\AppData\Roaming\acontis_technologies\workspaces\HvDebugRemote\projects\RealtimeDemo

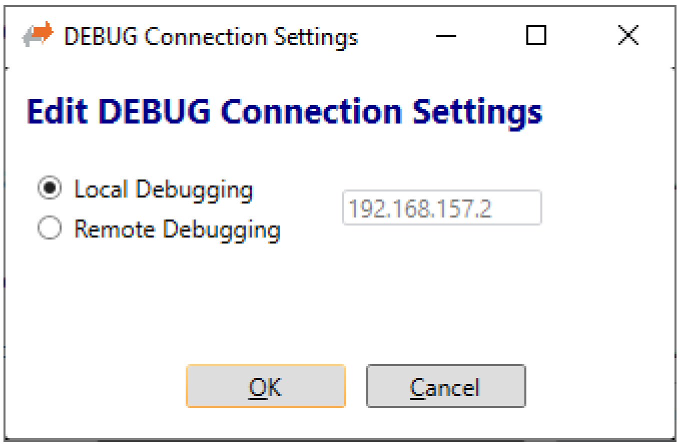
Open Project with Visual Studio...
Create Project Shortcut...

Debugging [✓ Local Debugging] Remote Debugging 192.168.157.2

Show EtherCAT Devices Only | RTOS Stopped | Real-time check | Workspace C:\Users\rte\AppData\Roaming\acontis_technologies\workspaces\HvDebugRemote

Fig. 2.4: Select debugging settings.

- `Edit DEBUG Connection Settings` dialog will pop up.

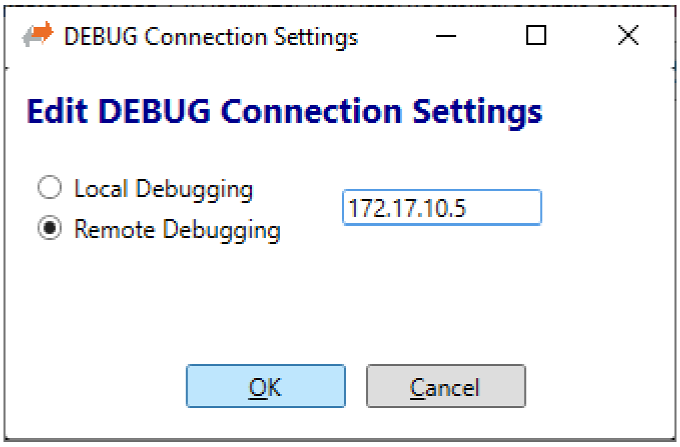


(● Local Debugging) ○ Remote Debugging

192.168.157.2

Fig. 2.5: Debugging settings dialog.

- Select `Remote Debugging` and enter the IP address of the Hypervisor Host. Please note, this IP address must **not be** in use by other computers in your network and it has to fit into your company's IP environment. You may have to ask your System Administrator to get a free IP address for that purpose. Both, Hypervisor Host and Development PC *must be* in the **same** network. In the following steps this IP address will be called `$Target-IP$`

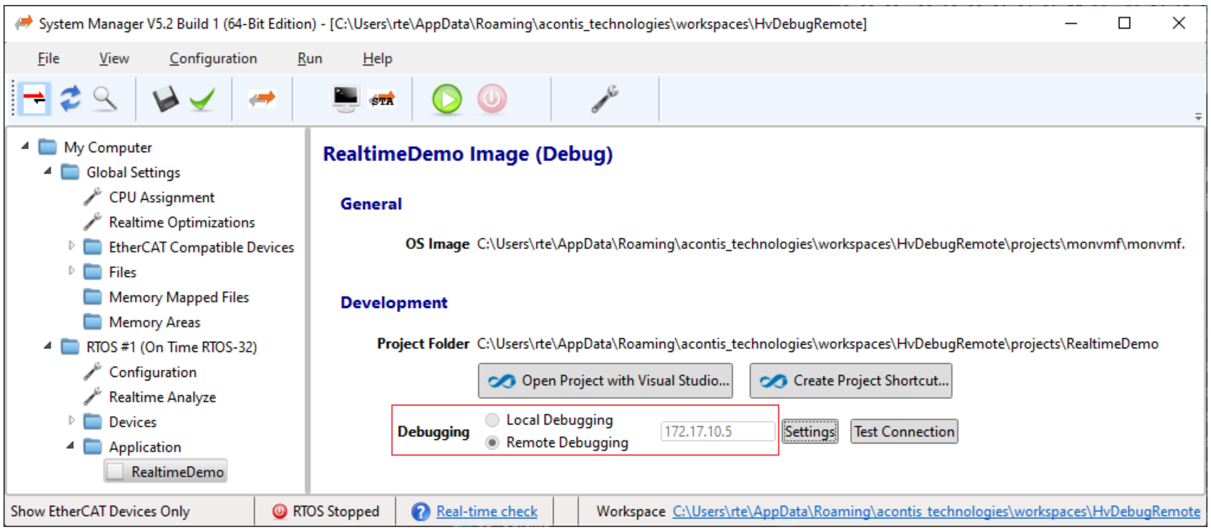


○ Local Debugging (● Remote Debugging)

172.17.10.5

Fig. 2.6: Debugging settings dialog. Remote IP entered.

- Push the `OK` button.
- Check if remote debugging and changed `$Target-IP$` has been saved.


System Manager V5.2 Build 1 (64-Bit Edition) - [C:\Users\rte\AppData\Roaming\acontis_technologies\workspaces\HvDebugRemote]
File
View
Configuration
Run
Help
My Computer
Global Settings
CPU Assignment
Realtime Optimizations
EtherCAT Compatible Devices
Files
Memory Mapped Files
Memory Areas
RTOS #1 (On Time RTOS-32)
Configuration
Realtime Analyze
Devices
Application
RealtimeDemo
Open Project with Visual Studio...
Create Project Shortcut...
Settings
Test Connection
Show EtherCAT Devices Only
RTOS Stopped
Real-time check

RealtimeDemo Image (Debug)

General

OS Image C:\Users\rte\AppData\Roaming\acontis_technologies\workspaces\HvDebugRemote\projects\monvmf\monvmf.

Development

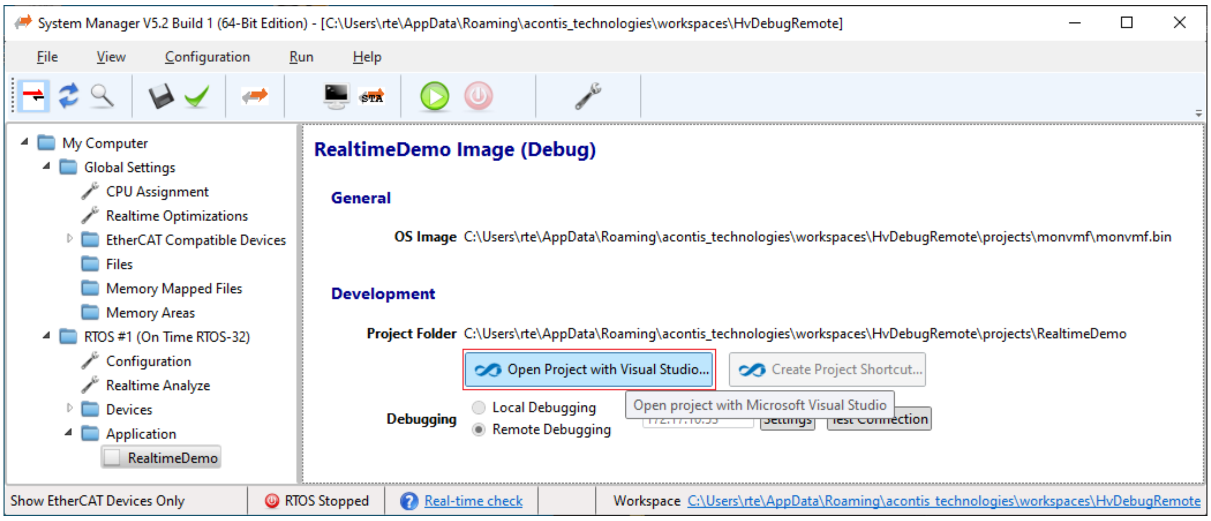
Project Folder C:\Users\rte\AppData\Roaming\acontis_technologies\workspaces\HvDebugRemote\projects\RealtimeDemo

Debugging: Local Debugging [✓ Remote Debugging] 172.17.10.5

Workspace C:\Users\rte\AppData\Roaming\acontis_technologies\workspaces\HvDebugRemote

Fig. 2.7: Debugging settings changed to remote IP.

- Push `Open Project with Visual Studio` button.


System Manager V5.2 Build 1 (64-Bit Edition) - [C:\Users\rte\AppData\Roaming\acontis_technologies\workspaces\HvDebugRemote]
File
View
Configuration
Run
Help
My Computer
Global Settings
CPU Assignment
Realtime Optimizations
EtherCAT Compatible Devices
Files
Memory Mapped Files
Memory Areas
RTOS #1 (On Time RTOS-32)
Configuration
Realtime Analyze
Devices
Application
RealtimeDemo
Open Project with Visual Studio...
Create Project Shortcut...
Open project with Microsoft Visual Studio
Settings
Test Connection
Show EtherCAT Devices Only
RTOS Stopped
Real-time check

RealtimeDemo Image (Debug)

General

OS Image C:\Users\rte\AppData\Roaming\acontis_technologies\workspaces\HvDebugRemote\projects\monvmf\monvmf.bin

Development

Project Folder C:\Users\rte\AppData\Roaming\acontis_technologies\workspaces\HvDebugRemote\projects\RealtimeDemo

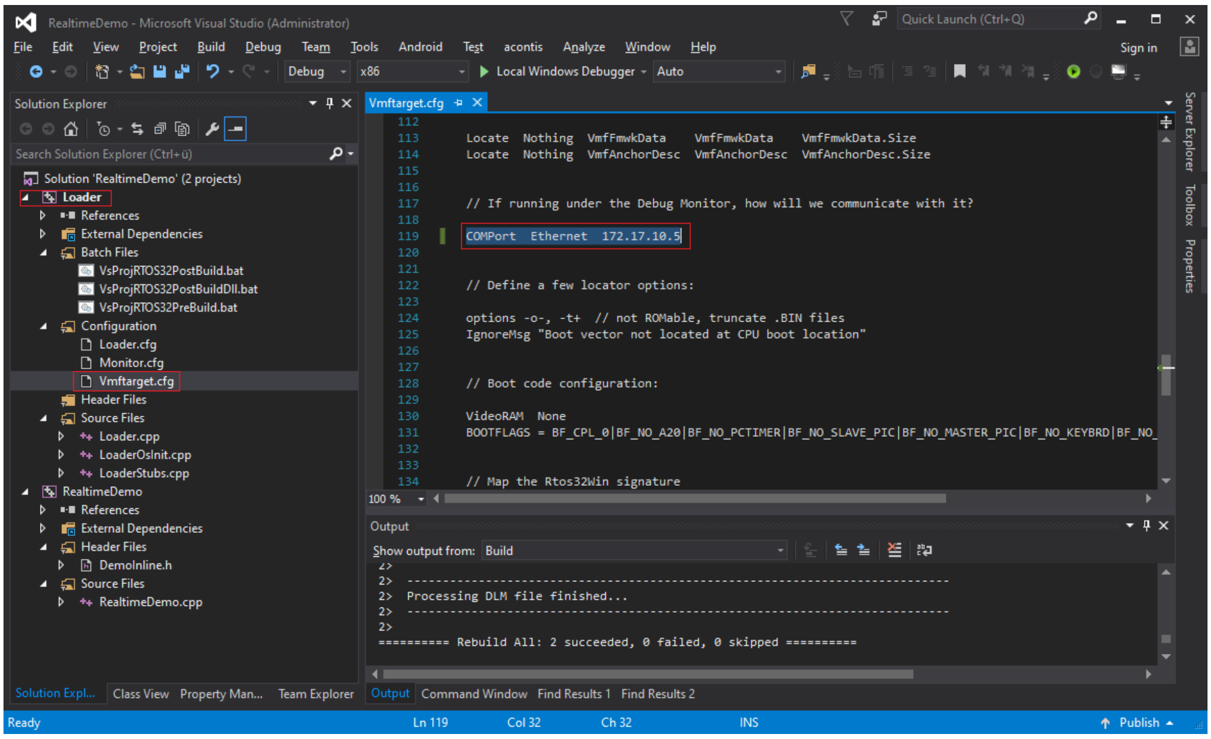
Debugging: Local Debugging [✓ Remote Debugging]

Workspace C:\Users\rte\AppData\Roaming\acontis_technologies\workspaces\HvDebugRemote

Fig. 2.8: Push button to open Visual Studio and automatically create the source project.
Project will be created and all required settings are set.

- Adjust `$Target-IP$` in generated *Visual Studio Loader* project.

  Select the file `Vmftarget.cfg` in the *Visual Studio Loader* project and edit the setting `COMPort Ethernet $Target-IP$`.

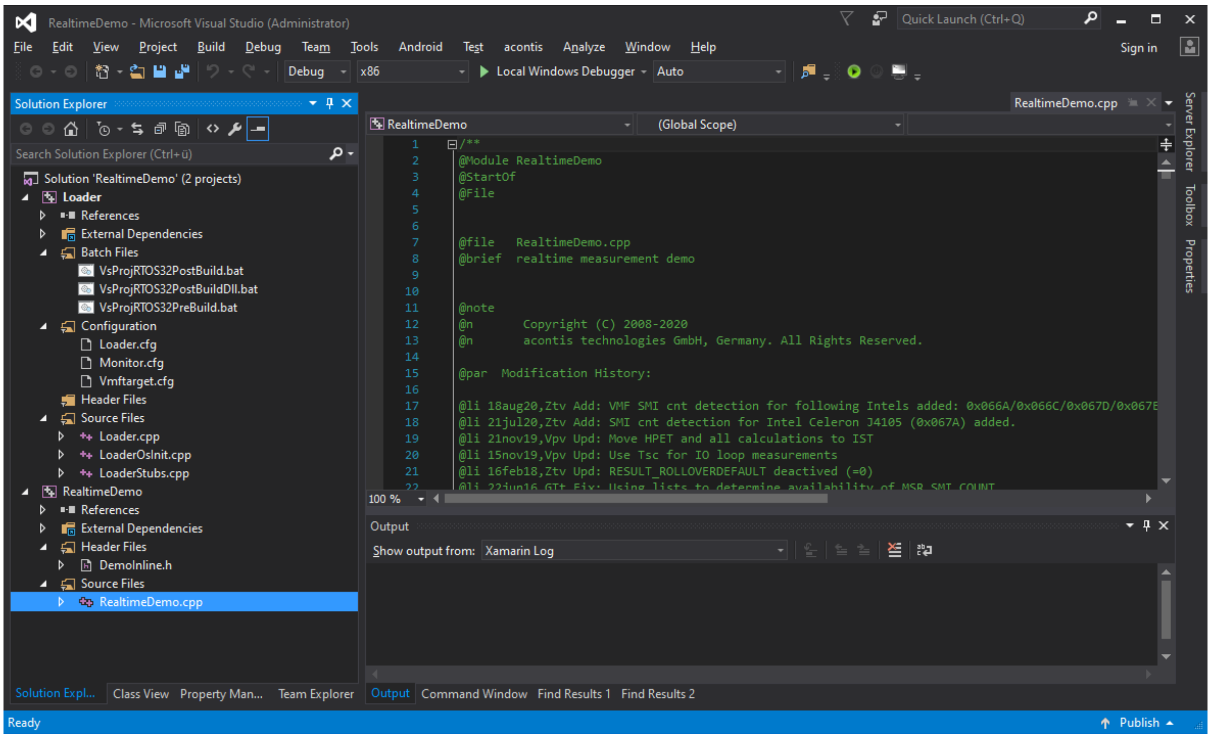


```
Locate  Nothing  VmfFmwkData    VmfFmwkData    VmfFmwkData.Size
Locate  Nothing  VmfAnchorDesc  VmfAnchorDesc  VmfAnchorDesc.Size


// If running under the Debug Monitor, how will we communicate with it?

COMPort  Ethernet  172.17.10.5


// Define a few locator options:

options -o-, -t+  // not ROMable, truncate .BIN files
IgnoreMsg "Boot vector not located at CPU boot location"


// Boot code configuration:

VideoRAM  None
BOOTFLAGS = BF_CPL_0|BF_NO_A20|BF_NO_PCTIMER|BF_NO_SLAVE_PIC|BF_NO_MASTER_PIC|BF_NO_KEYBRD|BF_NO_


// Map the Rtos32Win signature
```

```
2>
2>  -----------------------------------------------------------------------
2>  Processing DLM file finished...
2>  -----------------------------------------------------------------------
2>
========== Rebuild All: 2 succeeded, 0 failed, 0 skipped ==========
```

Fig. 2.9: Edit *Visual Studio Loader* project file `Vmftarget.cfg`.

- Press `F7` to compile the project, if first time compiled. Otherwise a **rebuild all** (`ALT` + `F7`) is required!



```
/**
@Module RealtimeDemo
@StartOf
@File


@file   RealtimeDemo.cpp
@brief  realtime measurement demo


@note
@n       Copyright (C) 2008-2020
@n       acontis technologies GmbH, Germany. All Rights Reserved.

@par  Modification History:

@li 18aug20,Ztv Add: VMF SMI cnt detection for following Intels added: 0x066A/0x066C/0x067D/0x067E
@li 21jul20,Ztv Add: SMI cnt detection for Intel Celeron J4105 (0x067A) added.
@li 21nov19,Vpv Upd: Move HPET and all calculations to IST
@li 15nov19,Vpv Upd: Use Tsc for IO loop measurements
@li 16feb18,Ztv Upd: RESULT_ROLLOVERDEFAULT deactived (=0)
@li 22jun16,GTt Fix: Using lists to determine availability of MSR_SMI_COUNT
```

Fig. 2.10: Visual Studio contains the generated source project.

3 Part B - Hypervisor Host Configuration

The following shell scripts are available on the Hypervisor Host to setup and establish a remote debug connection:

- command `hv_brvnetset` *creates* a virtual network bridge on Hypervisor Host to forward debugger `TCP/IP/UDP` packets from `LAN1` to the `RTOS-32 VM`. It is required to start this script if you need to perform *remote* debugging of a `RTOS-32` app from another machine.
- command `hv_brvnetclr` *deletes* bridge, after the `RTOS-32 VM` has been stopped.
- the `/hv/config/brvnetconfig.sh` file contains the configuration values for the bridge.

Hint: The configuration file `/hv/config/brvnetconfig.sh` must be adjusted, at least the `$IP$` address needs to fit to the environment.

Hint: See chapter “Bridge virtual and physical network” in the Hypervisor Manual for details how to configure the bridge.

4 Part C - guest folder

The debug monitor and the compiled debug files of the RTOS-32 project need to be available on the Hypervisor Host.

4.1 Recommended

It is recommended to create a network share for the guest folder (e.g. `/hv/guests/guestrtos32` directory on the Hypervisor Host).

Note: Every time a `DLM` project is changed and rebuilt on the Development PC it is **required** to copy it into the Hypervisor Host again! Therefore it's recommended to use the network share as *output* directory of the *Visual Studio* project.

As the Hypervisor Host is based on `Linux`, a `SMB` server is needed to accomplish this.

The Hypervisor Host includes such an `SMB` server (`SAMBA`), this server must be properly configured for this specific task.

Hint: The **default** user in this document is `rtv`. You may have to change this to your respective user. This user must also be a valid user on the Hypervisor Host. If it is missing, you may run the following command:

```
$ sudo adduser rtv
```

To create a file share which is accessible from a remote Windows computer, go to the `SAMBA` configuration file:

```
$ sudo mousepad /etc/samba/smb.conf
```

Add the following section to the end of the `smb.conf` file **(if not yet available)**. Update the path entry in the config file to match your guest folder, and then save the changes.

```
[debug]
  comment = Remote debug
  path = /hv/guests/guestxxxx
  browseable = yes
  valid users = rtv
  guest ok = yes
  read only = no
```

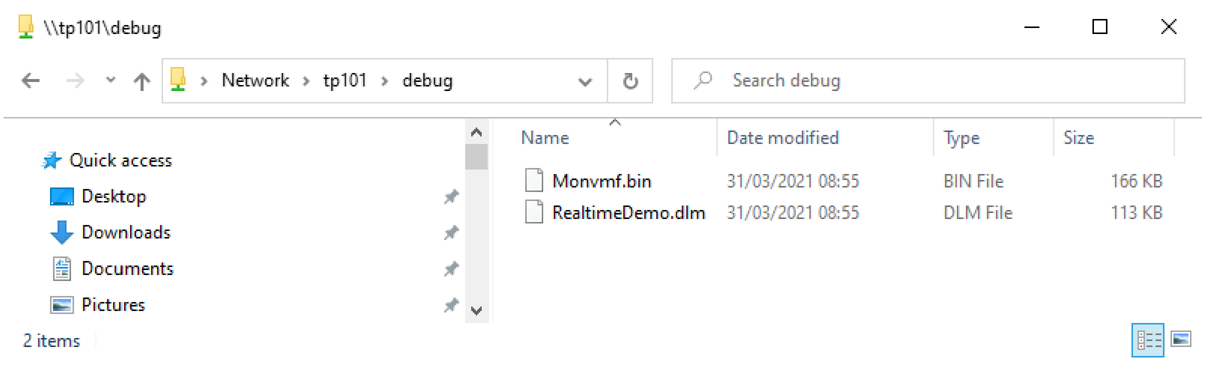
Allow the user `rtv` to access the `SAMBA` share:

```
$ sudo smbpasswd -a rtv
```

Restart the `SAMBA` service:

```
$ sudo systemctl restart smbd.service nmbd.service
```

To check, if the share is active, try to access the `SAMBA` share from the Windows explorer. You may have to use the IP address of the hypervisor.



\\tp101\debug

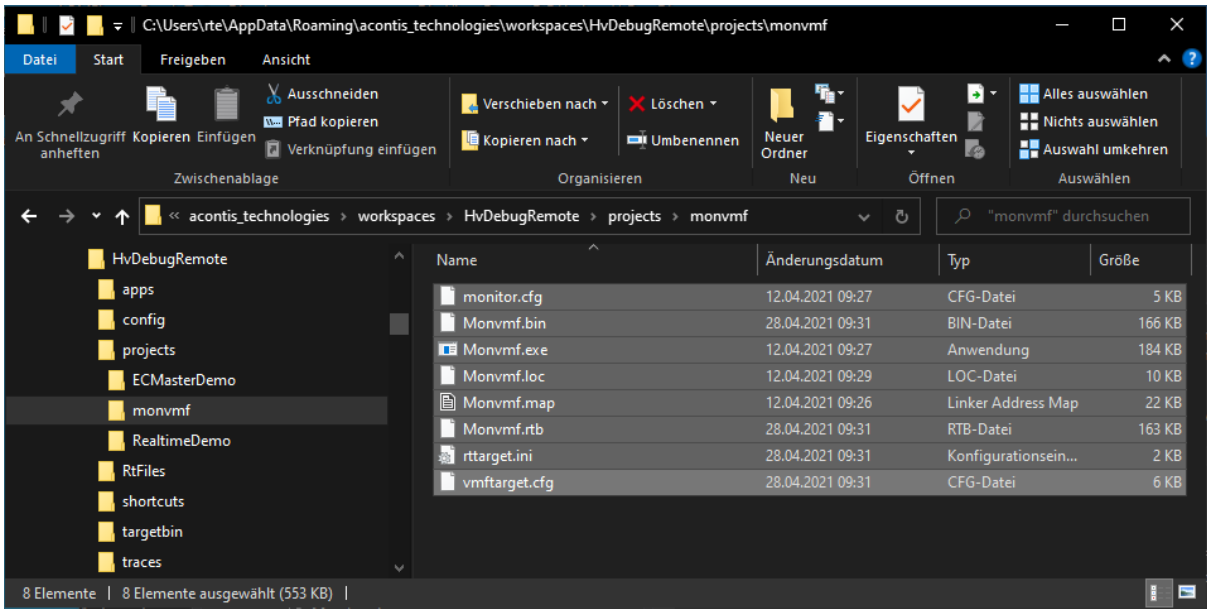
Name	Date modified	Type	Size
Monvmf.bin	31/03/2021 08:55	BIN File	166 KB
RealtimeDemo.dlm	31/03/2021 08:55	DLM File	113 KB

2 items

Fig. 4.1: Access to share from Windows file explorer.

4.2 Copy the Debug Monitor

In the following, the IP address `172.17.10.53`` is used for the Hypervisor Host computer. Copy the whole *Debug Monitor* directory `<host>\%WORKSPACE%\projects\monvmf\*.*` to `\\172.17.10.53\debug\*.*` and **override** the existing files. Do **not** remove any existing folders!



C:\Users\rte\AppData\Roaming\acontis_technologies\workspaces\HvDebugRemote\projects\monvmf

Name	Änderungsdatum	Typ	Größe
monitor.cfg	12.04.2021 09:27	CFG-Datei	5 KB
Monvmf.bin	28.04.2021 09:31	BIN-Datei	166 KB
Monvmf.exe	12.04.2021 09:27	Anwendung	184 KB
Monvmf.loc	12.04.2021 09:29	LOC-Datei	10 KB
Monvmf.map	12.04.2021 09:26	Linker Address Map	22 KB
Monvmf.rtb	28.04.2021 09:31	RTB-Datei	163 KB
rttarget.ini	28.04.2021 09:31	Konfigurationsein...	2 KB
vmftarget.cfg	28.04.2021 09:31	CFG-Datei	6 KB

8 Elemente | 8 Elemente ausgewählt (553 KB) |

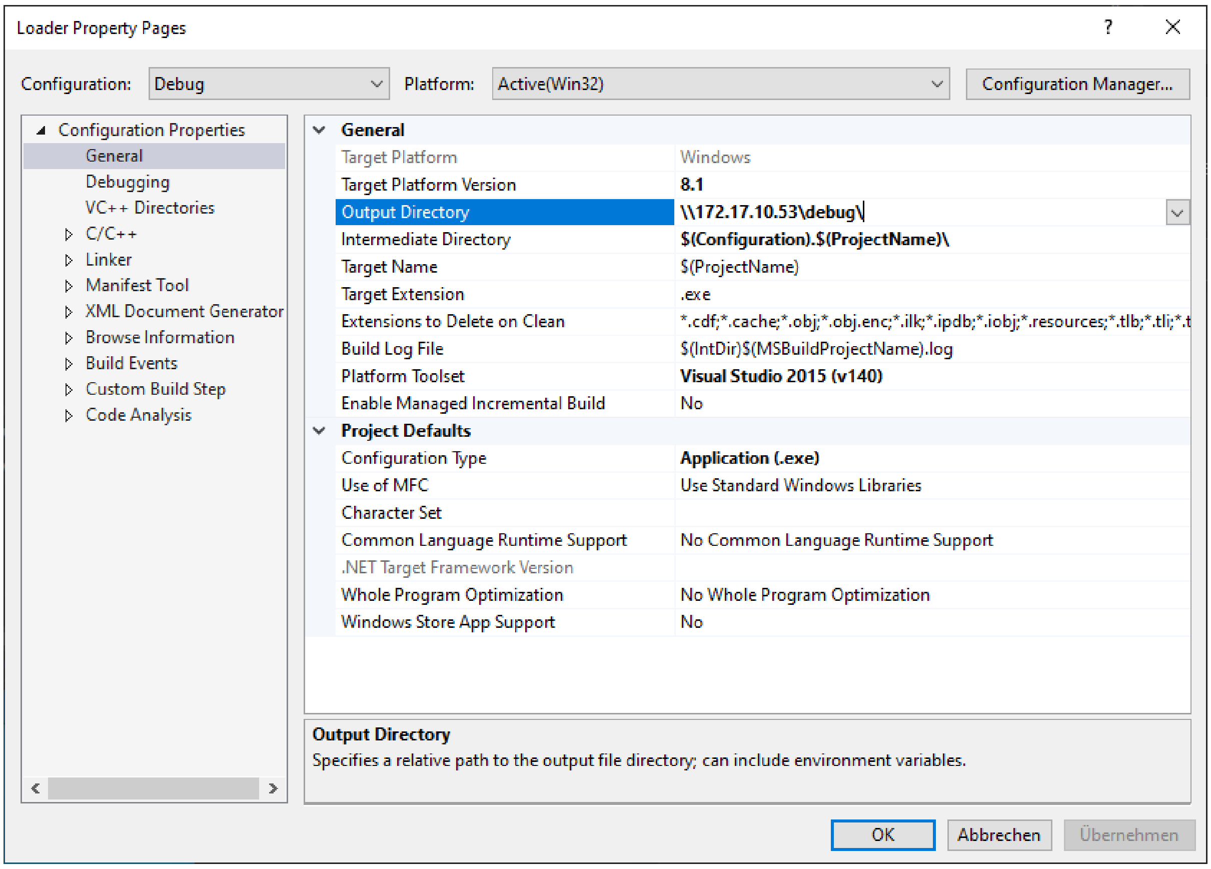
Fig. 4.2: Copy *Debug Monitor* directory.

Hint: Some of the files will be updated after rebuild of VS project.

4.3 Visual Studio Project Settings

The following screenshot shows how to set the output directory to the Hypervisor Host with IP address `172.17.10.53` and the network share name `debug`. This setting is required for **both** projects within the `Visual Studio` solution (*Loader* as well as the *DLM/DLL* project).

Caution: Adjust the `IP address` accordingly to your needs.



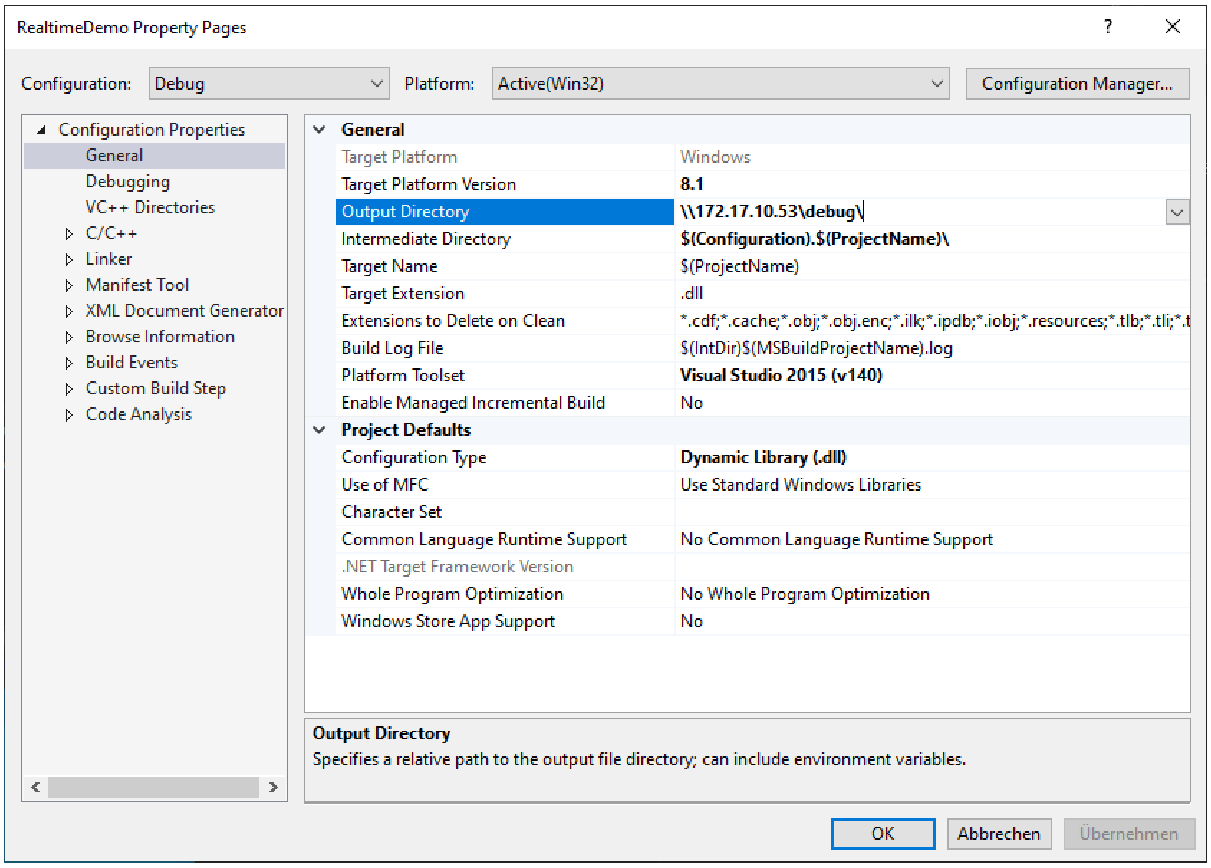
Loader Property Pages

Configuration: Debug   Platform: Active(Win32)

General	
Target Platform	Windows
Target Platform Version	8.1
Output Directory	\\172.17.10.53\debug\
Intermediate Directory	$(Configuration).$(ProjectName)\
Target Name	$(ProjectName)
Target Extension	.exe
Extensions to Delete on Clean	*.cdf;*.cache;*.obj;*.obj.enc;*.ilk;*.ipdb;*.iobj;*.resources;*.tlb;*.tli;*.t
Build Log File	$(IntDir)$(MSBuildProjectName).log
Platform Toolset	Visual Studio 2015 (v140)
Enable Managed Incremental Build	No
Project Defaults	
Configuration Type	Application (.exe)
Use of MFC	Use Standard Windows Libraries
Character Set	
Common Language Runtime Support	No Common Language Runtime Support
.NET Target Framework Version	
Whole Program Optimization	No Whole Program Optimization
Windows Store App Support	No

Output Directory
Specifies a relative path to the output file directory; can include environment variables.

Fig. 4.3: Visual Studio Loader Project Settings.



Configuration: Debug   Platform: Active(Win32)

General

Target Platform	Windows
Target Platform Version	**8.1**
Output Directory	\\172.17.10.53\debug\
Intermediate Directory	**$(Configuration).$(ProjectName)**
Target Name	$(ProjectName)
Target Extension	.dll
Extensions to Delete on Clean	*.cdf;*.cache;*.obj;*.obj.enc;*.ilk;*.ipdb;*.iobj;*.resources;*.tlb;*.tli;*.t
Build Log File	$(IntDir)$(MSBuildProjectName).log
Platform Toolset	**Visual Studio 2015 (v140)**
Enable Managed Incremental Build	No

Project Defaults

Configuration Type	**Dynamic Library (.dll)**
Use of MFC	Use Standard Windows Libraries
Character Set	
Common Language Runtime Support	No Common Language Runtime Support
.NET Target Framework Version	
Whole Program Optimization	No Whole Program Optimization
Windows Store App Support	No

Output Directory
Specifies a relative path to the output file directory; can include environment variables.

Fig. 4.4: Visual Studio RealtimeDemo Project Settings.

5 Part D - Hypervisor Host Configuration

Hint: This guide focuses on the RTOS-32 example guest. Initially, the Hypervisor Host does not provide any example guest folders. To switch to the RTOS-32 guest example, you need to perform the appropriate initialization. For instructions on initializing the examples, please see the **RTOS Guests** chapter in the Hypervisor Manual.

```
hv_open_example rtos32
hv_sync_example rtos32
cd /hv/guests/guestrtos32
```

Adjust the guest configuration setting to prepare starting the *RTOS-32 Debug Monitor*:

```
$ cd /hv/guests/guestrtos32
$ mousepad usr_guest_config.sh
```

and add the following line:

```
export osImage=$HV_ROOT/guests/guestrtos32/Monvmf.bin
```

Start the *RTOS-32 Debug Monitor*:

```
$ cd /hv/guests/guestrtos32
$ hv_guest_start -view
```

The output of the *RTOS-32 Debug Monitor* should be similar to:

```
RTTarget-32 Debug Monitor 6.29 Evaluation Version
Copyright (c) 1996,2022 On Time Informatik GmbH

Monitor Header at: 04037A3C, Current CPL: 0
Ethernet: RTOS32Win VNet, MAC: AA-BB-CC-DD-EE-03, IP: 172.17.10.5
```

Open a new terminal window (right click on desktop and select *'Open Terminal here'* **or** press `CRTL` + `ALT` + `T`)

Configure a bridge which connects the external network (where the Development PC is located) with the virtual network (where RTOS-32 is connected to). See section `Bridge virtual and physical network` in the `Hypervisor` manual for details.

Create bridged network connection:

```
$ sudo hv_brvnetset
```

Output of successful bridge creation:

```
rtv@rtv-TEST:/hv/guests/guestrtos32$ sudo hv_brvnetset
[sudo] password for rtv:
load vnet bridge configuration
add enp2s0 and vnet0 to bridge vnetbr
bridge name bridge id           STP enabled interfaces
vnetbr      8000.0060c8000000   no          enp2s0
                                            vnet0
ifconfig vnetbr 172.17.10.53 netmask 255.255.0.0
ip route add default via 172.17.5.2
RTNETLINK answers: No such process
```

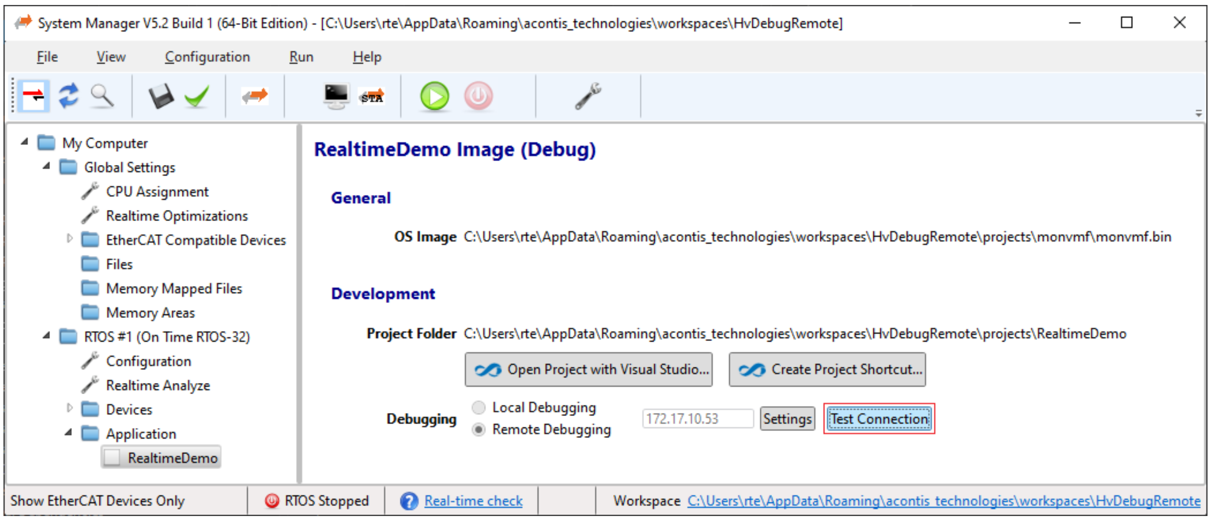
Important: Remove the bridged network connection after debugging!

```
$ sudo hv_brvnetclr
```

Hint: See chapter “Bridge virtual and physical network” in the Hypervisor Manual for details how to configure the bridge.

6 Part E - Development Host Configuration

- Scroll to `<Development|Debugging>` section and push the `Test Connection` button.


System Manager V5.2 Build 1 (64-Bit Edition) - [C:\Users\rte\AppData\Roaming\acontis_technologies\workspaces\HvDebugRemote]

RealtimeDemo Image (Debug)

General

OS Image C:\Users\rte\AppData\Roaming\acontis_technologies\workspaces\HvDebugRemote\projects\monvmf\monvmf.bin

Development

Project Folder C:\Users\rte\AppData\Roaming\acontis_technologies\workspaces\HvDebugRemote\projects\RealtimeDemo

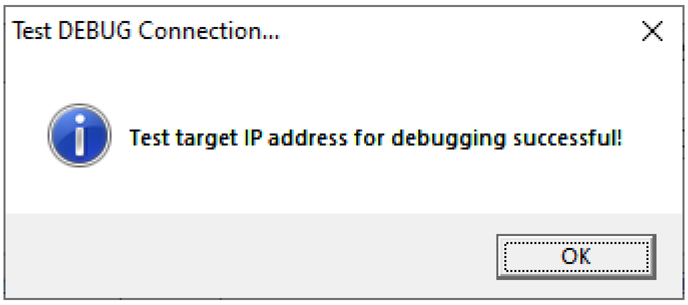
Open Project with Visual Studio...
Create Project Shortcut...

Debugging ○ Local Debugging ● Remote Debugging 172.17.10.53

Workspace C:\Users\rte\AppData\Roaming\acontis_technologies\workspaces\HvDebugRemote

Fig. 6.1: Push `Test Connection` button.

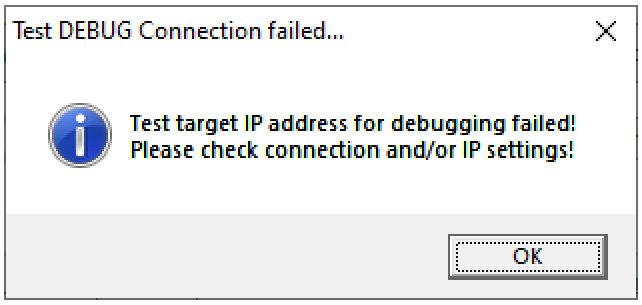
  - Successful


Test DEBUG Connection...

Test target IP address for debugging successful!

Fig. 6.2: Test Connection successful.

  - Failed


Test DEBUG Connection failed...

Test target IP address for debugging failed!
Please check connection and/or IP settings!

Fig. 6.3: Test Connection **NOT** successful.

- Pressing `F5` in Visual Studio will start the debugging.

7 Important hints

Important: After changing the `$Target-IP$` on Hypervisor Host side, the steps `C - E` have to be repeated **always**! Furthermore, a running instance of Visual Studio with the current project **must** be restarted and then the project **must** be recompiled with `rebuild all` command.

Caution: Do **not** re-launch the debug monitor in an on-going debug session!