Praktikum: Echtzeit-Computergrafik

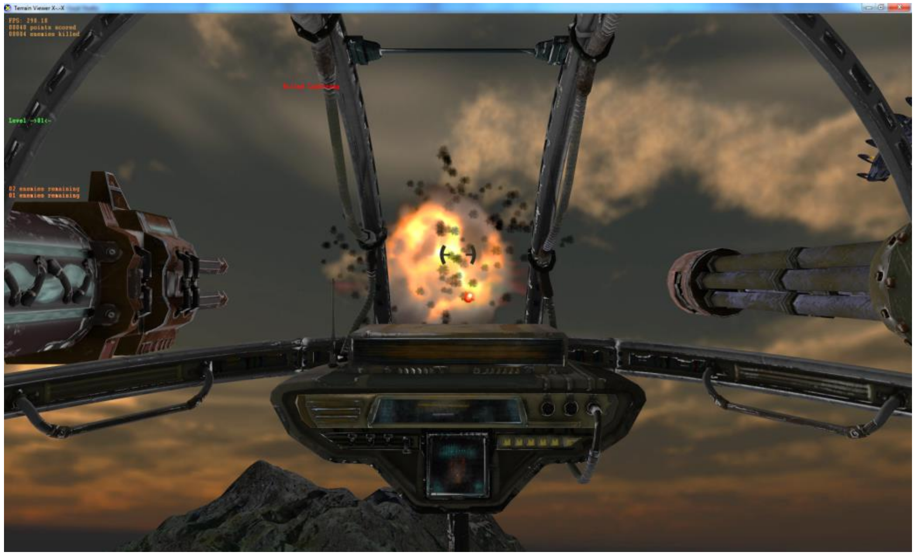
tum.3D

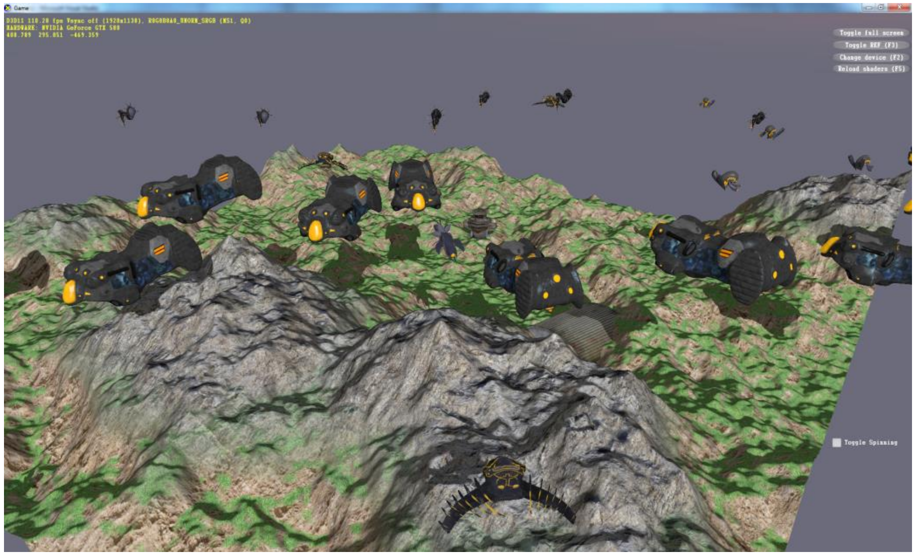
computer graphics & visualization

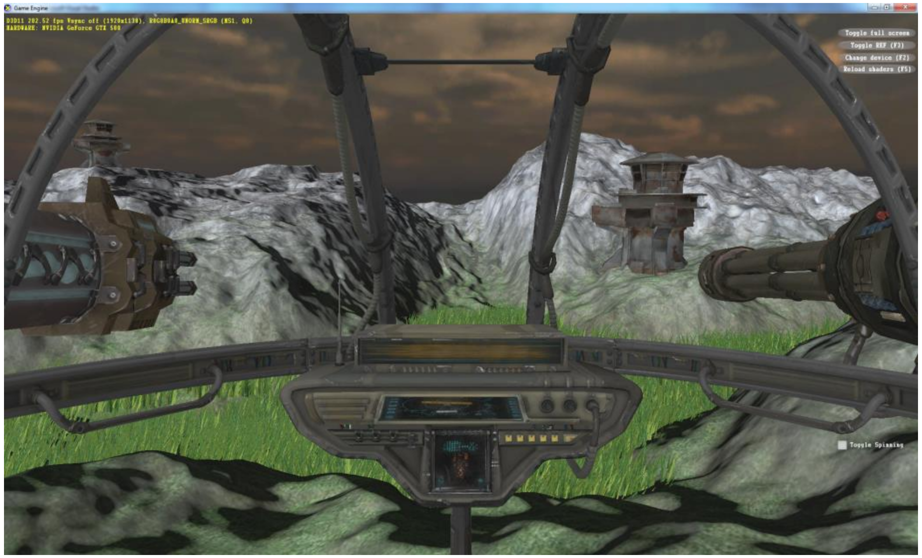
Incoming

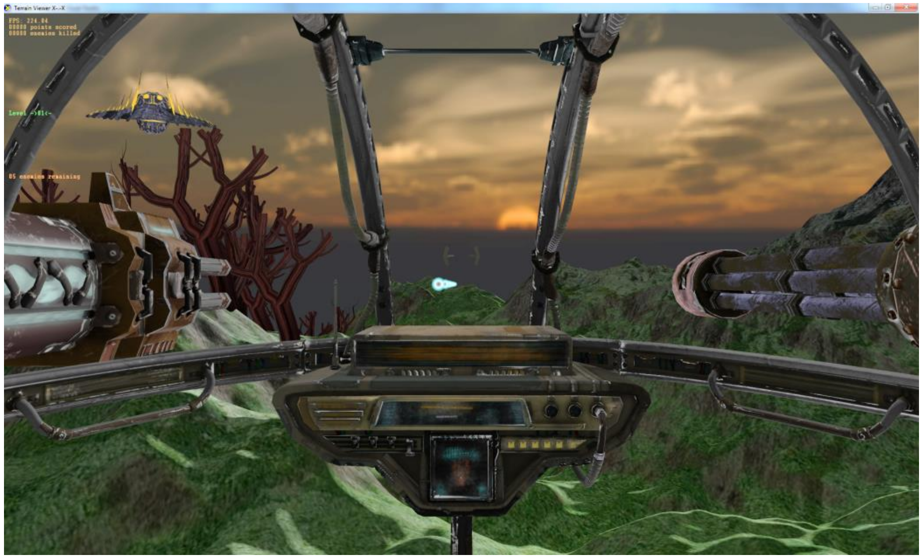
INCOMING
CURRENT FPS 12.13
WORST FPS 7.93
BEST FPS 24.81
AVERAGE FPS 13.99
TOTAL TIME 157.93
TOTAL FRAMES 2210
FRAMES LEFT 2790
675-RDU
Rage Software

Incoming: Previous Results


Terrain Viewer X--X
Level ->01<-


Game
Toggle full screen
Toggle REF (F3)
Change device (F2)
Reload shaders (F5)
Toggle Spinning


Game Engine
Toggle full screen
Toggle REF (F3)
Change device (F2)
Reload shaders (F5)
Toggle Spinning


Terrain Viewer X--X

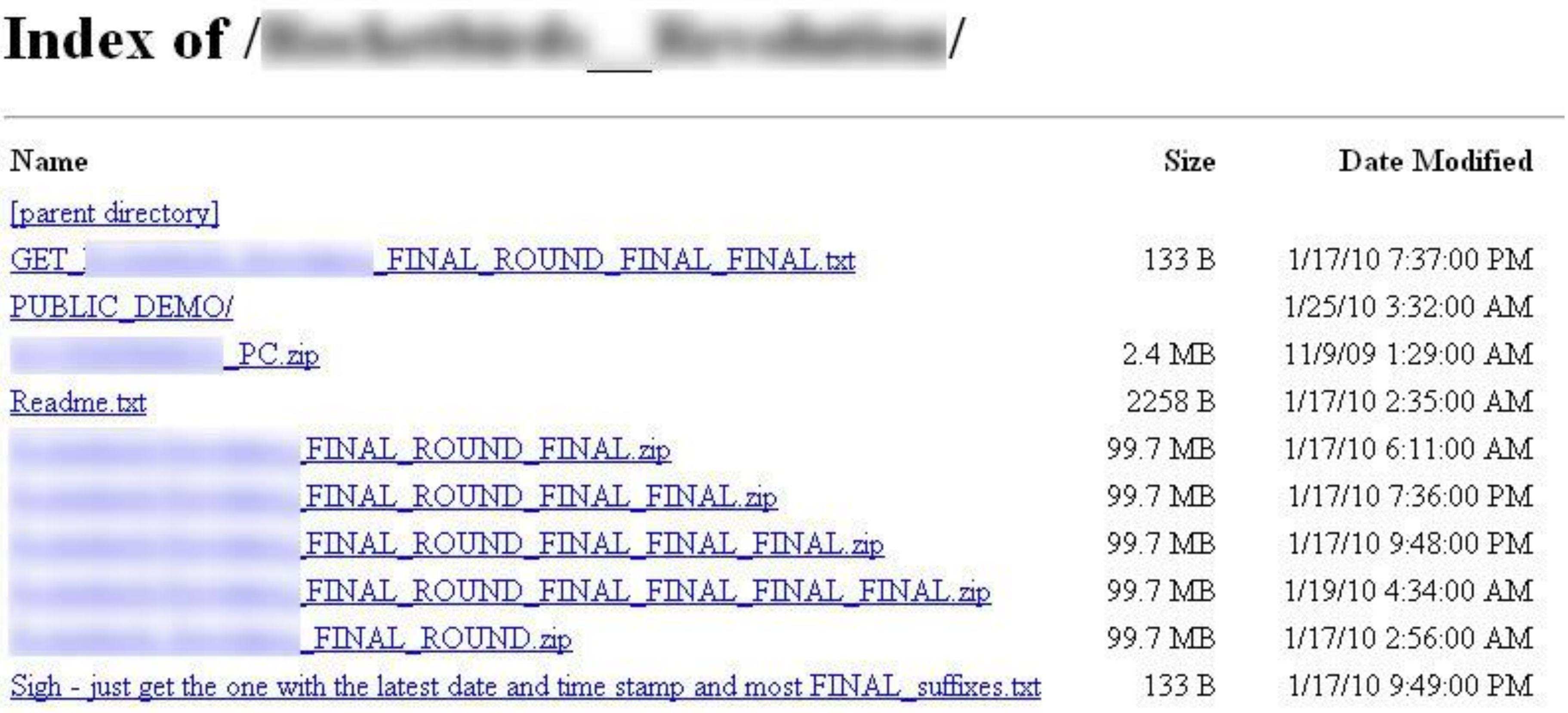
Incoming

- Build a game „from scratch“
  - No existing engine

- Of course we can not write a game engine in one semester…
  - Focus on rendering (DirectX)
  - Also a bit of particle systems, physics, game object management, configurations etc

- But let‘s start slowly

Git(and other SCM)



Index of /[redacted]/

Name	Size	Date Modified
[parent directory]		
GET_[redacted]_FINAL_ROUND_FINAL_FINAL.txt	133 B	1/17/10 7:37:00 PM
PUBLIC_DEMO/		1/25/10 3:32:00 AM
[redacted]_PC.zip	2.4 MB	11/9/09 1:29:00 AM
Readme.txt	2258 B	1/17/10 2:35:00 AM
[redacted]FINAL_ROUND_FINAL.zip	99.7 MB	1/17/10 6:11:00 AM
[redacted]FINAL_ROUND_FINAL_FINAL.zip	99.7 MB	1/17/10 7:36:00 PM
[redacted]FINAL_ROUND_FINAL_FINAL_FINAL.zip	99.7 MB	1/17/10 9:48:00 PM
[redacted]FINAL_ROUND_FINAL_FINAL_FINAL_FINAL.zip	99.7 MB	1/19/10 4:34:00 AM
[redacted]_FINAL_ROUND.zip	99.7 MB	1/17/10 2:56:00 AM
Sigh - just get the one with the latest date and time stamp and most FINAL_suffixes.txt	133 B	1/17/10 9:49:00 PM

Git (and other SCM)

- Software Configuration Management
- Tools to solve problems like:
  - Multiple developers working on the same project
  - Tracking changes
- **Each** project with more than a single developer needs an SCM system
- Benefits for a single developer, too: Rollback, Branches, etc.

Git

- Centralized: one server, multiple clients
- Each change must be „commited“ to the server
  - Each „Commit“ increases the revision number

- All changes are „atomic“: repository always consistent
- Each revision can be restored
  - Tracking changes
  - Reverting errors

Git

- Sourcecode history is stored on the server

- You work on a „working copy“
  - Basically a copy of a revision
  - May contain local changes
  - „Per file“ basis
    - So only a part of your working copy might be up-to-date if you choose so

Git

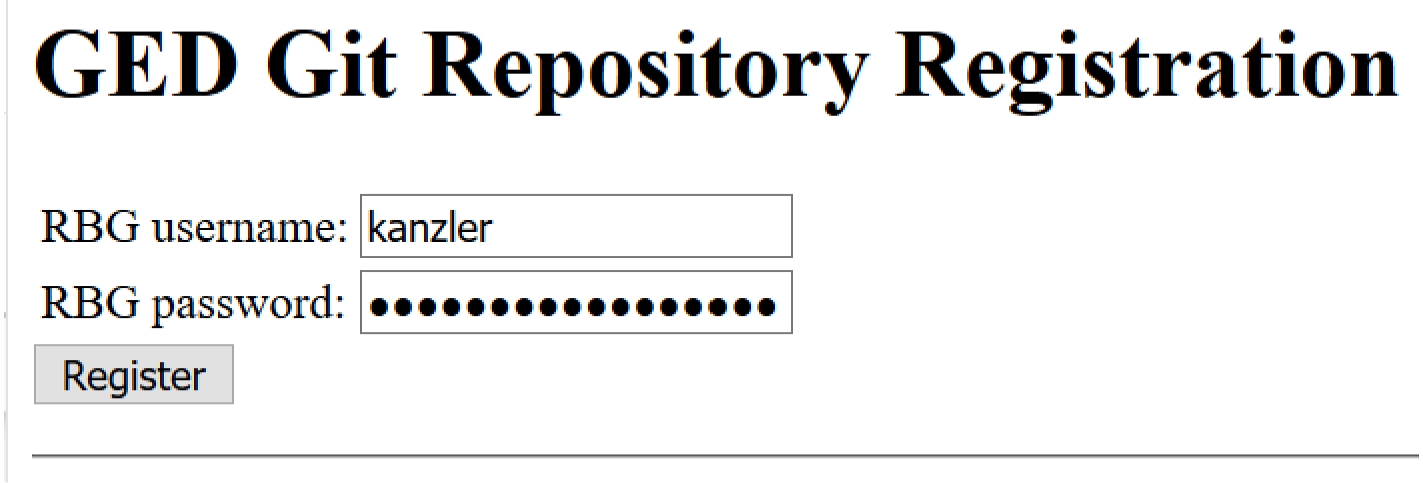
- *Every* file of the project needs to be in your Git repository
  - Everything needed to build the program
  - You will work on multiple PCs!
  - Check regularly if this is the case
- Do *not* add files created from your code to your repository
  - *.exe, *.dll
  - Automatically created and temporary files
    - *.opensln, *.sdf, etc…
    - See the first assignment for details

Git

- „Commit early, commit often“
  - So you can also trace small changes with great impact…
- update before you start working
- update before and after a commit
  - Reduces conflicts
- Ignore list: Add Debug, `Release`, `.ncb`, `.suo`, etc.
- **Always** include a **meaningful** Commit-Message
  - Helps you track down changes

Git

- Get access to repositories:
  - https://tum3d.in.tum.de:80/ged/register.php
  - RBG Account is used for accessing our Git Repository
  - https://wiki.in.tum.de/Informatik/Helpdesk/Account



GED Git Repository Registration

RBG username: kanzler

RBG password: ••••••••••••••••••

Git

- 2 Git Repositories:
  - https://tum3d.in.tum.de:80/git/SS20/GED/external
    - Contains Meshes, Textures, Examples, Libraries, Assignments, Slides, etc
    - Updates!
  - https://tum3d.in.tum.de:80/git/SS20/GED/<username>
    - Your source code
    - Graded by your tutor
- Help!
  - Git: https://git-scm.com/doc
  - TortoiseGit: https://tortoisegit.org/
  - Sebastian Weiß *sebastian.weiss@in.tum.de*

Git: GED Rooms

- You can checkout your repository, to a folder of your choice, say `.\ged\<username>`
  - Do not forget to commit and push before logging out!

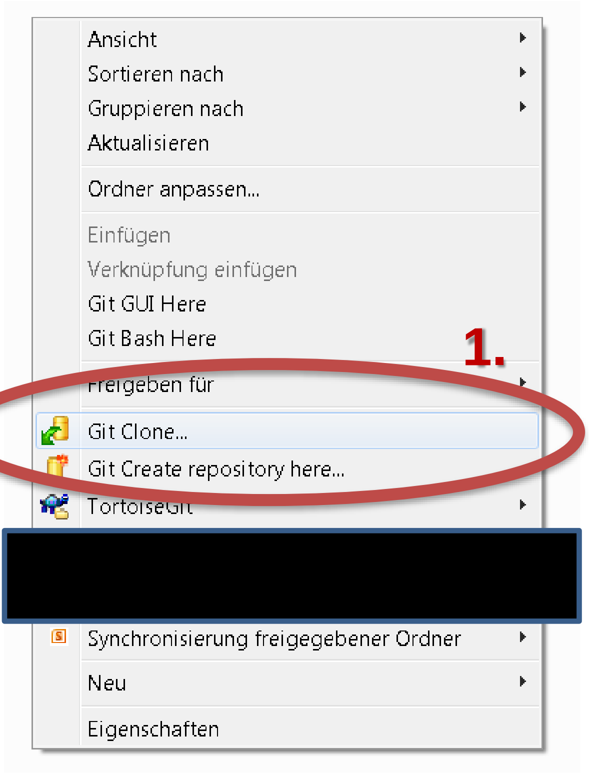
- Checkout `external` to `.\ged\external`
  - Update before you start working!

- Important: Use the same parent folder!

GED Git Server

Git

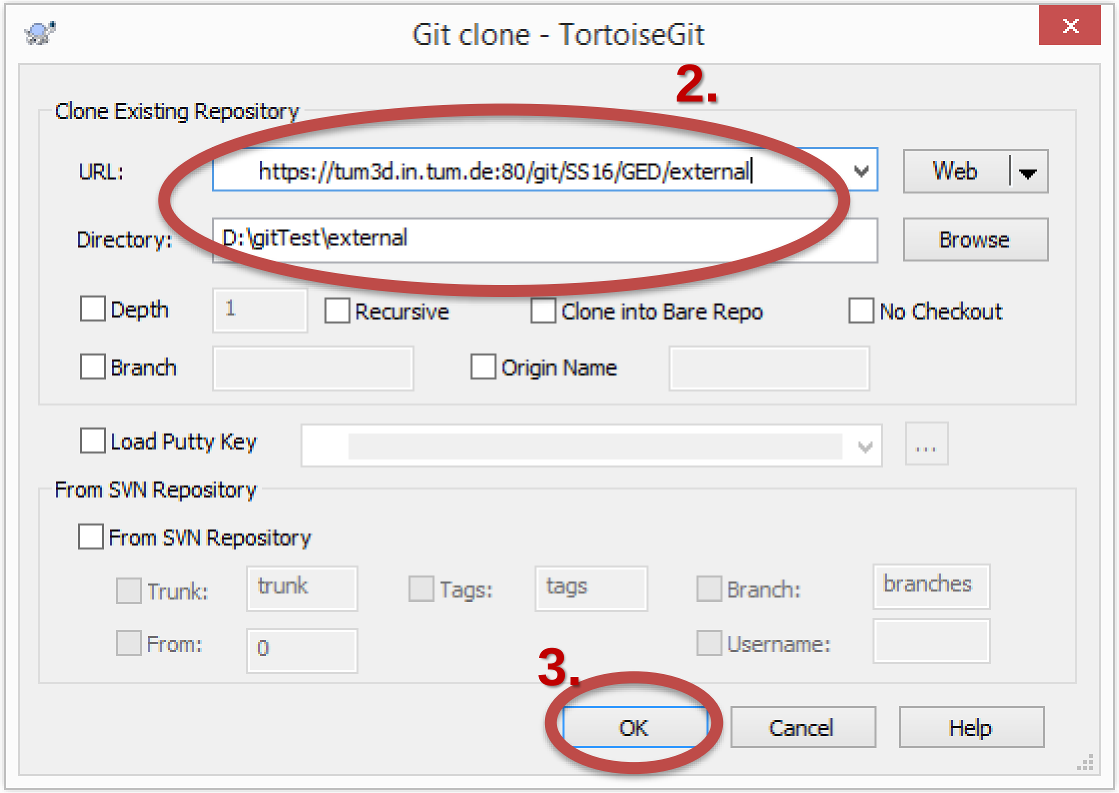
- Checkout with TortoiseGit



1.

Ansicht
Sortieren nach
Gruppieren nach
Aktualisieren
Ordner anpassen...
Einfügen
Verknüpfung einfügen
Git GUI Here
Git Bash Here
Freigeben für
Git Clone...
Git Create repository here...
TortoiseGit
Synchronisierung freigegebener Ordner
Neu
Eigenschaften

[redacted]



Git clone - TortoiseGit

2.

Clone Existing Repository

URL: https://tum3d.in.tum.de:80/git/SS16/GED/external

Directory: D:\gitTest\external

☐ Depth 1 ☐ Recursive ☐ Clone into Bare Repo ☐ No Checkout

☐ Branch ☐ Origin Name

☐ Load Putty Key

From SVN Repository

☐ From SVN Repository

☐ Trunk: trunk ☐ Tags: tags ☐ Branch: branches

☐ From: 0 ☐ Username:

3.

Web
Browse
...
OK
Cancel
Help

Git

- Checkout `external` and `<username>` to the same folder!

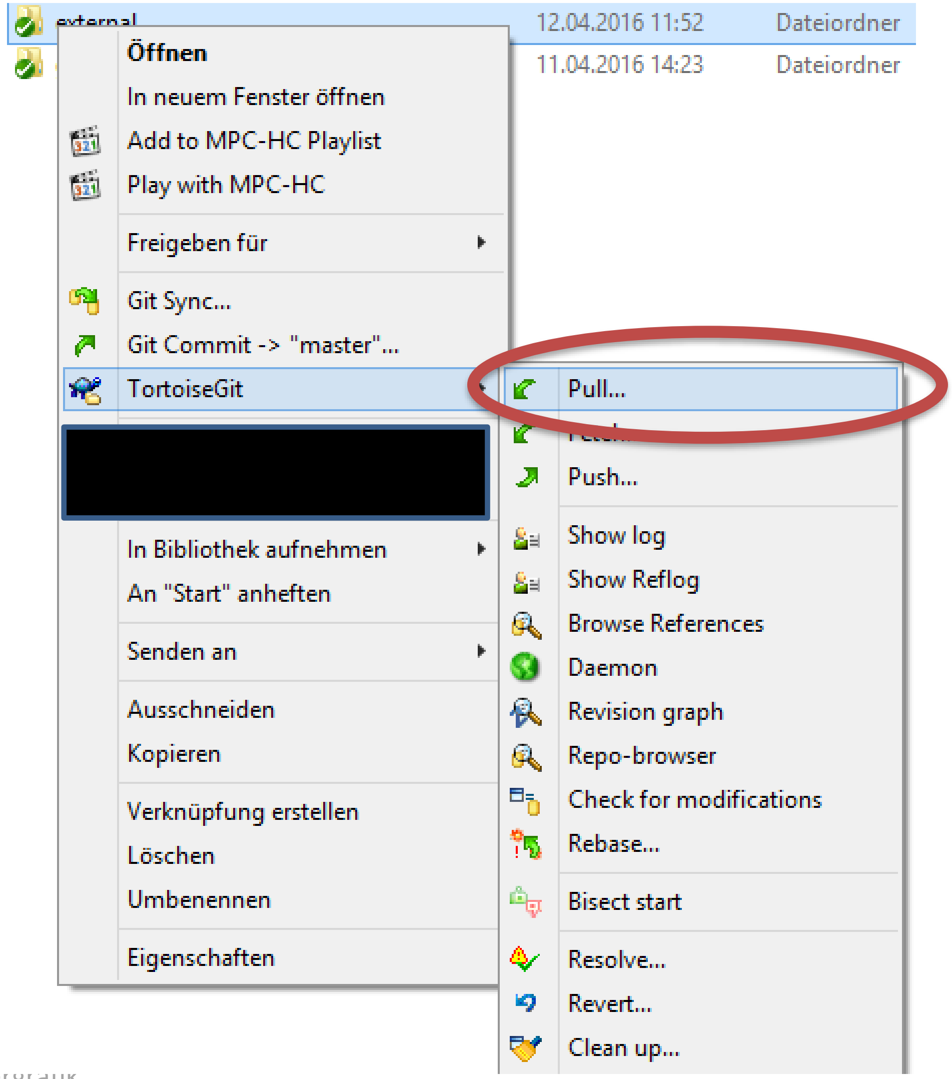
external
Dateiordner

username
Dateiordner

- Only work in your folder, don‘t change anything in external

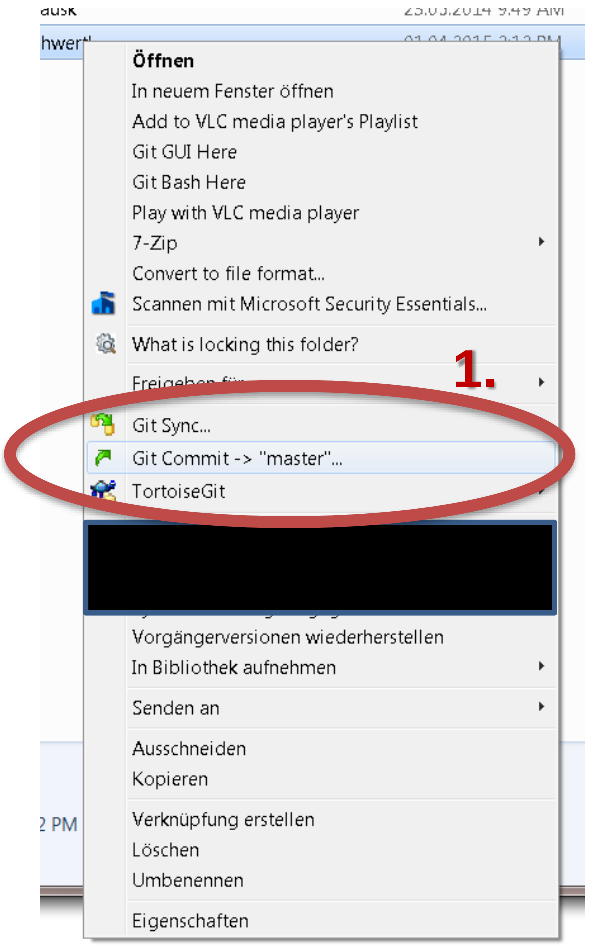
Git

- Update local repository with TortoiseGit

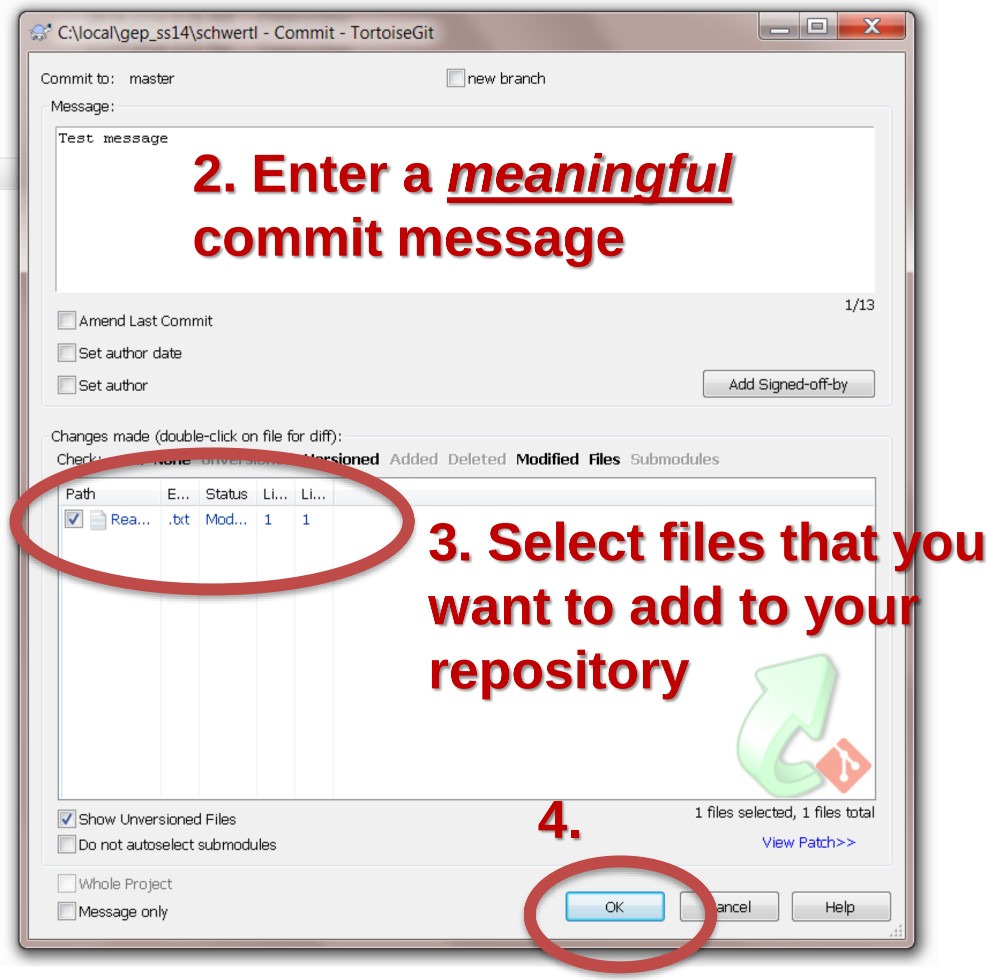

external
12.04.2016 11:52
Dateiordner
11.04.2016 14:23
Dateiordner
Öffnen
In neuem Fenster öffnen
Add to MPC-HC Playlist
Play with MPC-HC
Freigeben für
Git Sync...
Git Commit -> "master"...
TortoiseGit
[redacted]
In Bibliothek aufnehmen
An "Start" anheften
Senden an
Ausschneiden
Kopieren
Verknüpfung erstellen
Löschen
Umbenennen
Eigenschaften
Pull...
Push...
Show log
Show Reflog
Browse References
Daemon
Revision graph
Repo-browser
Check for modifications
Rebase...
Bisect start
Resolve...
Revert...
Clean up...

Git

- Commit
- Adding changes to the local repository


Öffnen
In neuem Fenster öffnen
Add to VLC media player's Playlist
Git GUI Here
Git Bash Here
Play with VLC media player
7-Zip
Convert to file format...
Scannen mit Microsoft Security Essentials...
What is locking this folder?
Freigeben für
Git Sync...
Git Commit -> "master"...
TortoiseGit
[redacted]
Vorgängerversionen wiederherstellen
In Bibliothek aufnehmen
Senden an
Ausschneiden
Kopieren
Verknüpfung erstellen
Löschen
Umbenennen
Eigenschaften

1.


C:\local\gep_ss14\schwertl - Commit - TortoiseGit

Commit to: master ☐ new branch

Message:

Test message

2. Enter a _meaningful_ commit message

1/13

☐ Amend Last Commit

☐ Set author date

☐ Set author

Add Signed-off-by

Changes made (double-click on file for diff):

Check: None Unversioned Versioned Added Deleted Modified Files Submodules

Path	E...	Status	Li...	Li...
☑ Rea...	.txt	Mod...	1	1

3. Select files that you want to add to your repository

☑ Show Unversioned Files

☐ Do not autoselect submodules

1 files selected, 1 files total

☐ Whole Project

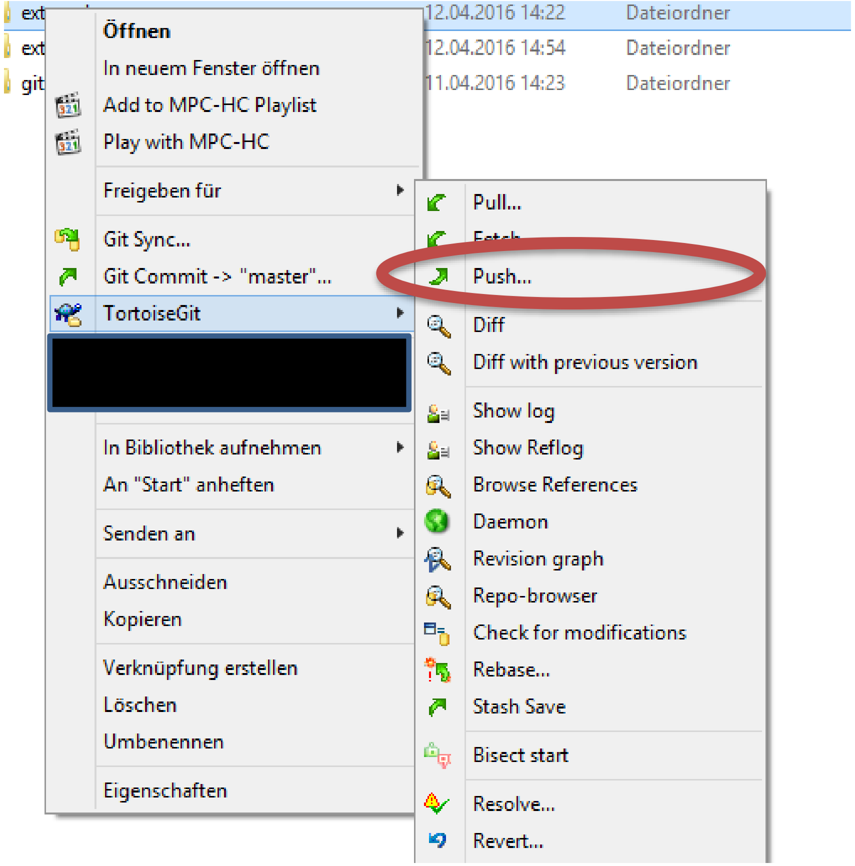
☐ Message only

4.

OK
ancel
Help

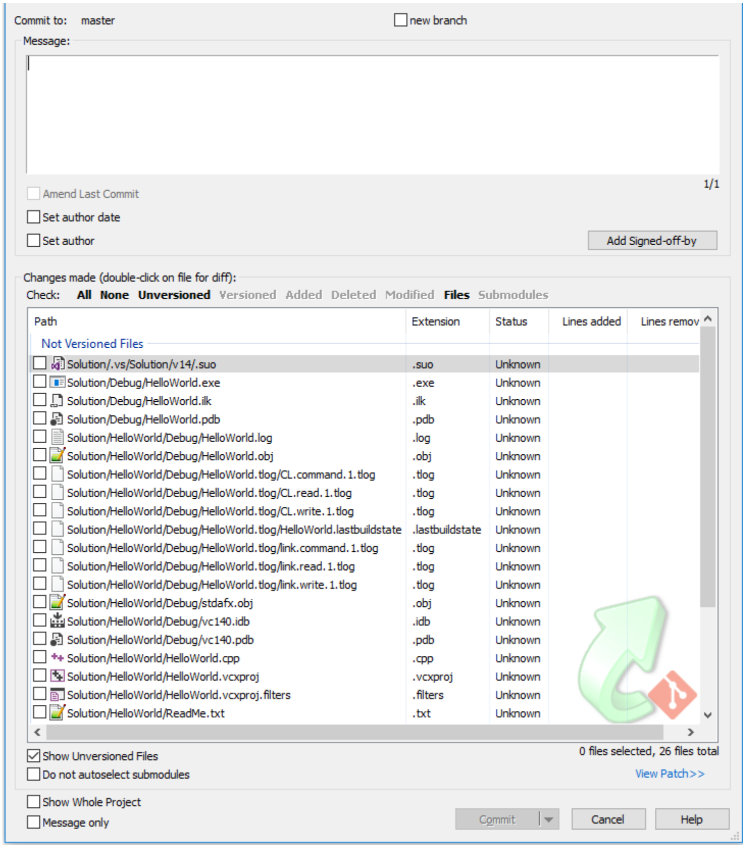
Git

- Push
- To upload your (local) commits to the server


ext
ext
git
12.04.2016 14:22
Dateiordner
12.04.2016 14:54
Dateiordner
11.04.2016 14:23
Dateiordner
Öffnen
In neuem Fenster öffnen
Add to MPC-HC Playlist
Play with MPC-HC
Freigeben für
Git Sync...
Git Commit -> "master"...
TortoiseGit
[redacted]
In Bibliothek aufnehmen
An "Start" anheften
Senden an
Ausschneiden
Kopieren
Verknüpfung erstellen
Löschen
Umbenennen
Eigenschaften
Pull...
Fetch...
Push...
Diff
Diff with previous version
Show log
Show Reflog
Browse References
Daemon
Revision graph
Repo-browser
Check for modifications
Rebase...
Stash Save
Bisect start
Resolve...
Revert...

Git

- “.gitignore” textfile specifies intentionally untracked files to ignore



Commit to: master ☐ new branch

Message:

1/1

☐ Amend Last Commit

☐ Set author date

☐ Set author

Changes made (double-click on file for diff):

Check: **All** **None** **Unversioned** Versioned Added Deleted Modified **Files** Submodules

Not Versioned Files

	Path	Extension	Status	Lines added	Lines remov
☐	Solution/.vs/Solution/v14/.suo	.suo	Unknown		
☐	Solution/Debug/HelloWorld.exe	.exe	Unknown		
☐	Solution/Debug/HelloWorld.ilk	.ilk	Unknown		
☐	Solution/Debug/HelloWorld.pdb	.pdb	Unknown		
☐	Solution/HelloWorld/Debug/HelloWorld.log	.log	Unknown		
☐	Solution/HelloWorld/Debug/HelloWorld.obj	.obj	Unknown		
☐	Solution/HelloWorld/Debug/HelloWorld.tlog/CL.command.1.tlog	.tlog	Unknown		
☐	Solution/HelloWorld/Debug/HelloWorld.tlog/CL.read.1.tlog	.tlog	Unknown		
☐	Solution/HelloWorld/Debug/HelloWorld.tlog/CL.write.1.tlog	.tlog	Unknown		
☐	Solution/HelloWorld/Debug/HelloWorld.tlog/HelloWorld.lastbuildstate	.lastbuildstate	Unknown		
☐	Solution/HelloWorld/Debug/HelloWorld.tlog/link.command.1.tlog	.tlog	Unknown		
☐	Solution/HelloWorld/Debug/HelloWorld.tlog/link.read.1.tlog	.tlog	Unknown		
☐	Solution/HelloWorld/Debug/HelloWorld.tlog/link.write.1.tlog	.tlog	Unknown		
☐	Solution/HelloWorld/Debug/stdafx.obj	.obj	Unknown		
☐	Solution/HelloWorld/Debug/vc140.idb	.idb	Unknown		
☐	Solution/HelloWorld/Debug/vc140.pdb	.pdb	Unknown		
☐	Solution/HelloWorld/HelloWorld.cpp	.cpp	Unknown		
☐	Solution/HelloWorld/HelloWorld.vcxproj	.vcxproj	Unknown		
☐	Solution/HelloWorld/HelloWorld.vcxproj.filters	.filters	Unknown		
☐	Solution/HelloWorld/ReadMe.txt	.txt	Unknown		

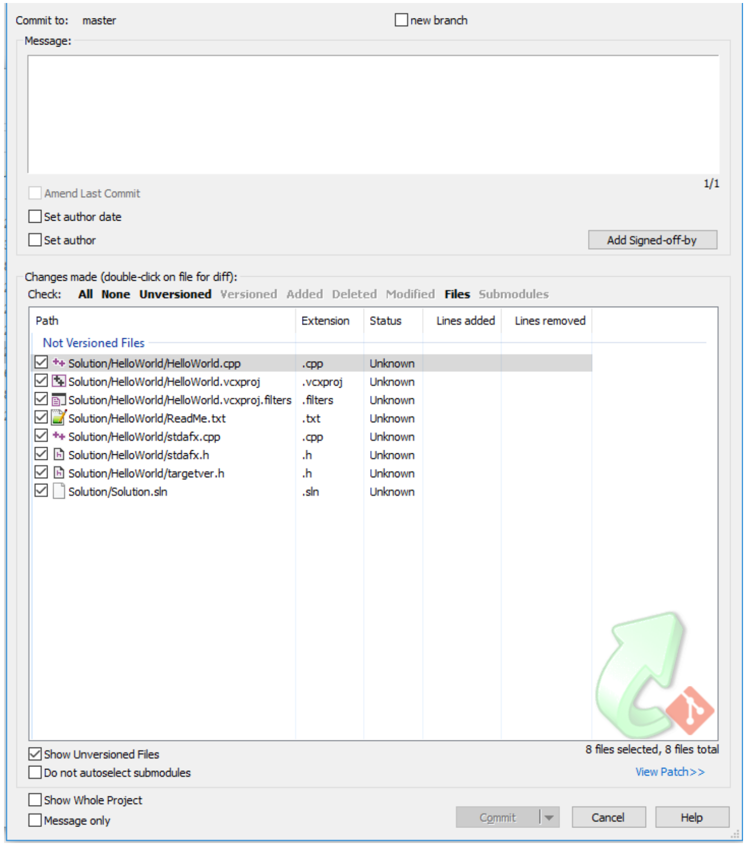
☑ Show Unversioned Files

☐ Do not autoselect submodules

0 files selected, 26 files total

☐ Show Whole Project

☐ Message only



Commit to: master ☐ new branch

Message:

1/1

☐ Amend Last Commit

☐ Set author date

☐ Set author

Changes made (double-click on file for diff):

Check: **All** **None** **Unversioned** Versioned Added Deleted Modified **Files** Submodules

Not Versioned Files

	Path	Extension	Status	Lines added	Lines removed
☑	Solution/HelloWorld/HelloWorld.cpp	.cpp	Unknown		
☑	Solution/HelloWorld/HelloWorld.vcxproj	.vcxproj	Unknown		
☑	Solution/HelloWorld/HelloWorld.vcxproj.filters	.filters	Unknown		
☑	Solution/HelloWorld/ReadMe.txt	.txt	Unknown		
☑	Solution/HelloWorld/stdafx.cpp	.cpp	Unknown		
☑	Solution/HelloWorld/stdafx.h	.h	Unknown		
☑	Solution/HelloWorld/targetver.h	.h	Unknown		
☑	Solution/Solution.sln	.sln	Unknown		

☑ Show Unversioned Files

☐ Do not autoselect submodules

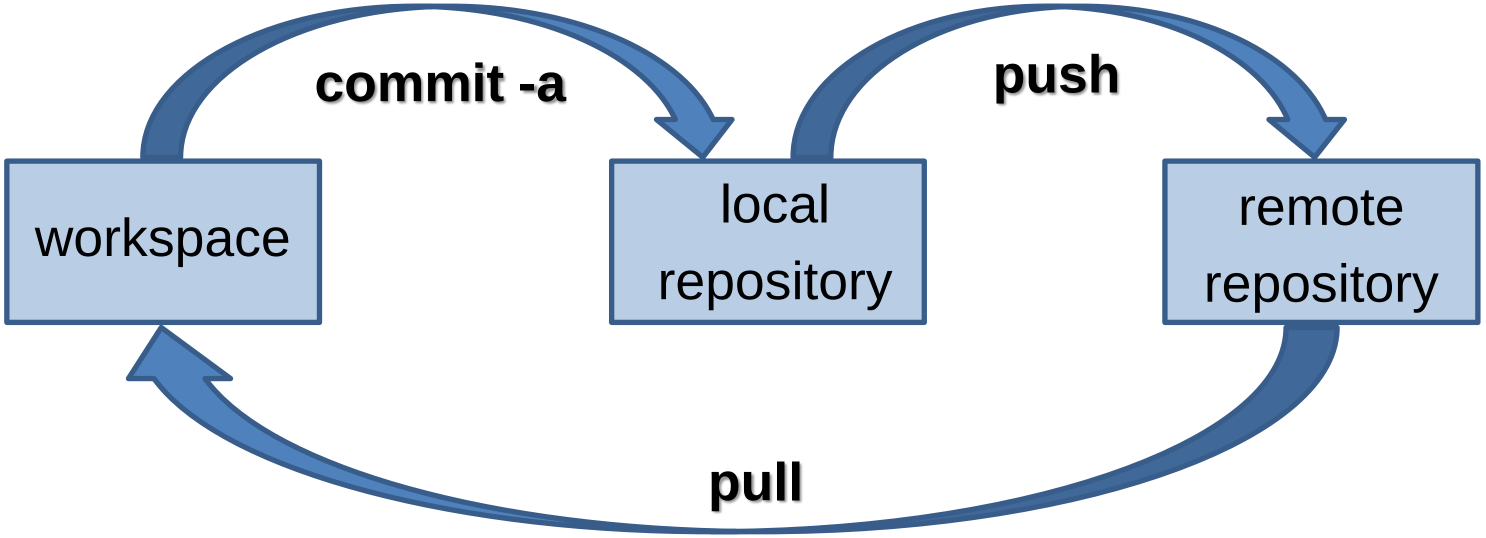
8 files selected, 8 files total

☐ Show Whole Project

☐ Message only

Git

- Simplified overview


commit -a
push
workspace
local repository
remote repository
pull

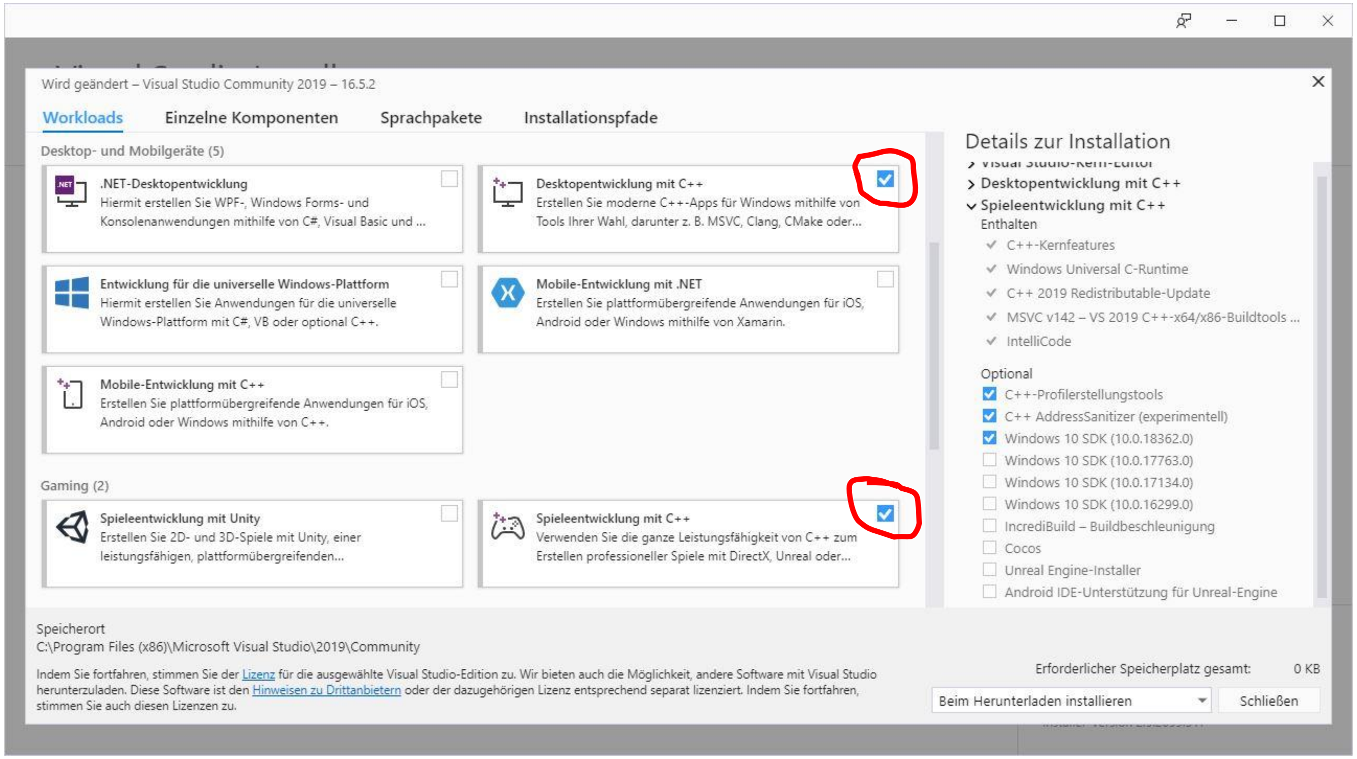
- More information: https://git-scm.com/book/en/v2

Visual Studio

- Microsofts IDE for C++, C#, VB, F#...
  - Not just a compiler
  - Editor w/ syntax highlighting, code completion etc
  - Debugger
  - Several other tools you won‘t need

Visual Studio

- Visual Studio Community 2019 https://visualstudio.microsoft.com/vs/community/
- Install with Desktop Development with C++ and Game Developement with C++



Wird geändert – Visual Studio Community 2019 – 16.5.2

Desktop- und Mobilgeräte (5)

☐ **.NET-Desktopentwicklung**
Hiermit erstellen Sie WPF-, Windows Forms- und Konsolenanwendungen mithilfe von C#, Visual Basic und ...

☑ **Desktopentwicklung mit C++**
Erstellen Sie moderne C++-Apps für Windows mithilfe von Tools Ihrer Wahl, darunter z. B. MSVC, Clang, CMake oder...

☐ **Entwicklung für die universelle Windows-Plattform**
Hiermit erstellen Sie Anwendungen für die universelle Windows-Plattform mit C#, VB oder optional C++.

☐ **Mobile-Entwicklung mit .NET**
Erstellen Sie plattformübergreifende Anwendungen für iOS, Android oder Windows mithilfe von Xamarin.

☐ **Mobile-Entwicklung mit C++**
Erstellen Sie plattformübergreifende Anwendungen für iOS, Android oder Windows mithilfe von C++.

Gaming (2)

☐ **Spieleentwicklung mit Unity**
Erstellen Sie 2D- und 3D-Spiele mit Unity, einer leistungsfähigen, plattformübergreifenden...

☑ **Spieleentwicklung mit C++**
Verwenden Sie die ganze Leistungsfähigkeit von C++ zum Erstellen professioneller Spiele mit DirectX, Unreal oder...

Details zur Installation

› Visual Studio-Kern-Editor
› Desktopentwicklung mit C++
⌄ Spieleentwicklung mit C++
  Enthalten
  ✓ C++-Kernfeatures
  ✓ Windows Universal C-Runtime
  ✓ C++ 2019 Redistributable-Update
  ✓ MSVC v142 – VS 2019 C++-x64/x86-Buildtools ...
  ✓ IntelliCode
  Optional
  ☑ C++-Profilerstellungstools
  ☑ C++ AddressSanitizer (experimentell)
  ☑ Windows 10 SDK (10.0.18362.0)
  ☐ Windows 10 SDK (10.0.17763.0)
  ☐ Windows 10 SDK (10.0.17134.0)
  ☐ Windows 10 SDK (10.0.16299.0)
  ☐ IncrediBuild – Buildbeschleunigung
  ☐ Cocos
  ☐ Unreal Engine-Installer
  ☐ Android IDE-Unterstützung für Unreal-Engine

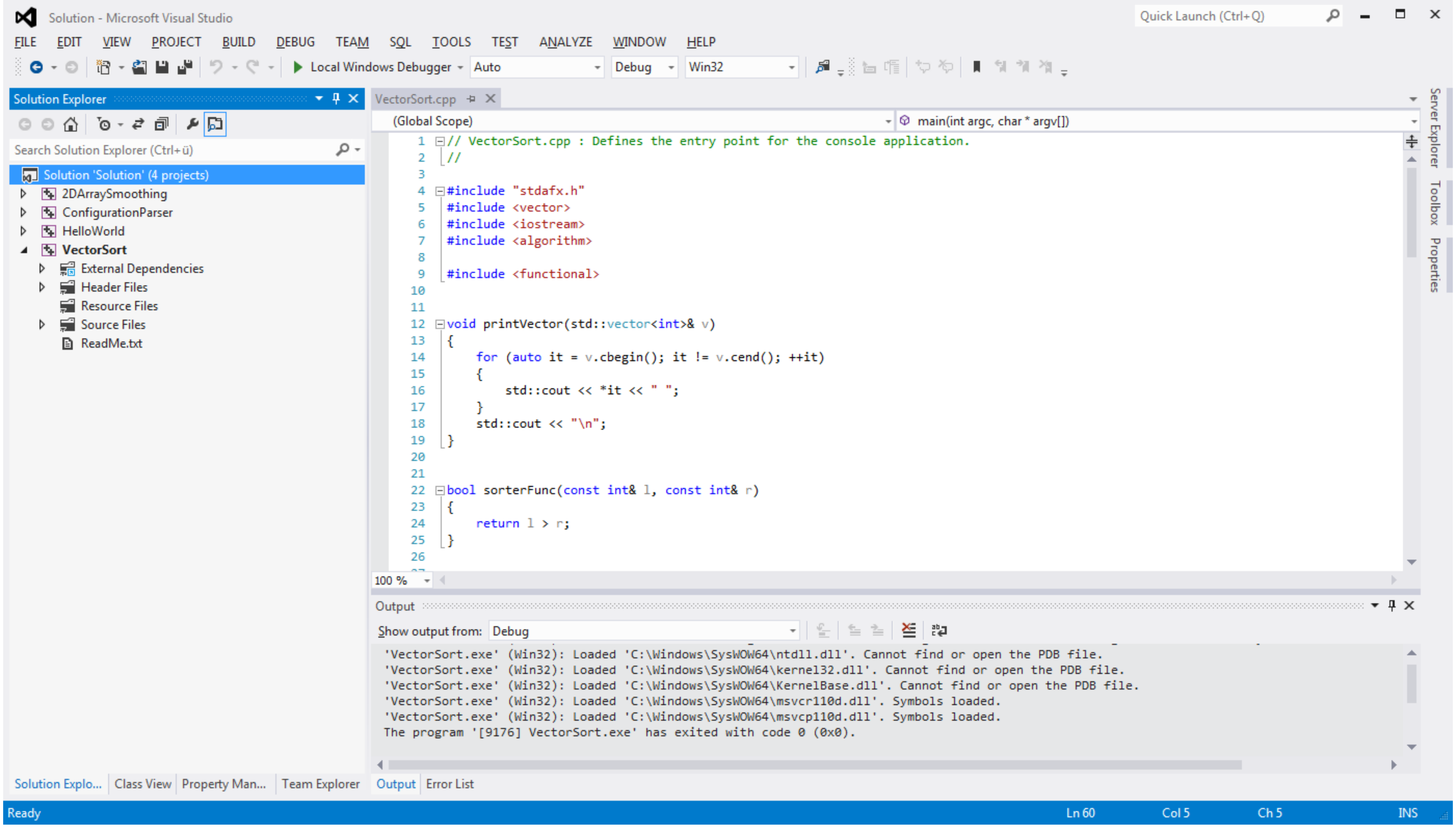
Speicherort
C:\Program Files (x86)\Microsoft Visual Studio\2019\Community

Indem Sie fortfahren, stimmen Sie der Lizenz für die ausgewählte Visual Studio-Edition zu. Wir bieten auch die Möglichkeit, andere Software mit Visual Studio herunterzuladen. Diese Software ist den Hinweisen zu Drittanbietern oder der dazugehörigen Lizenz entsprechend separat lizenziert. Indem Sie fortfahren, stimmen Sie auch diesen Lizenzen zu.

Erforderlicher Speicherplatz gesamt: 0 KB

Beim Herunterladen installieren

Visual Studio

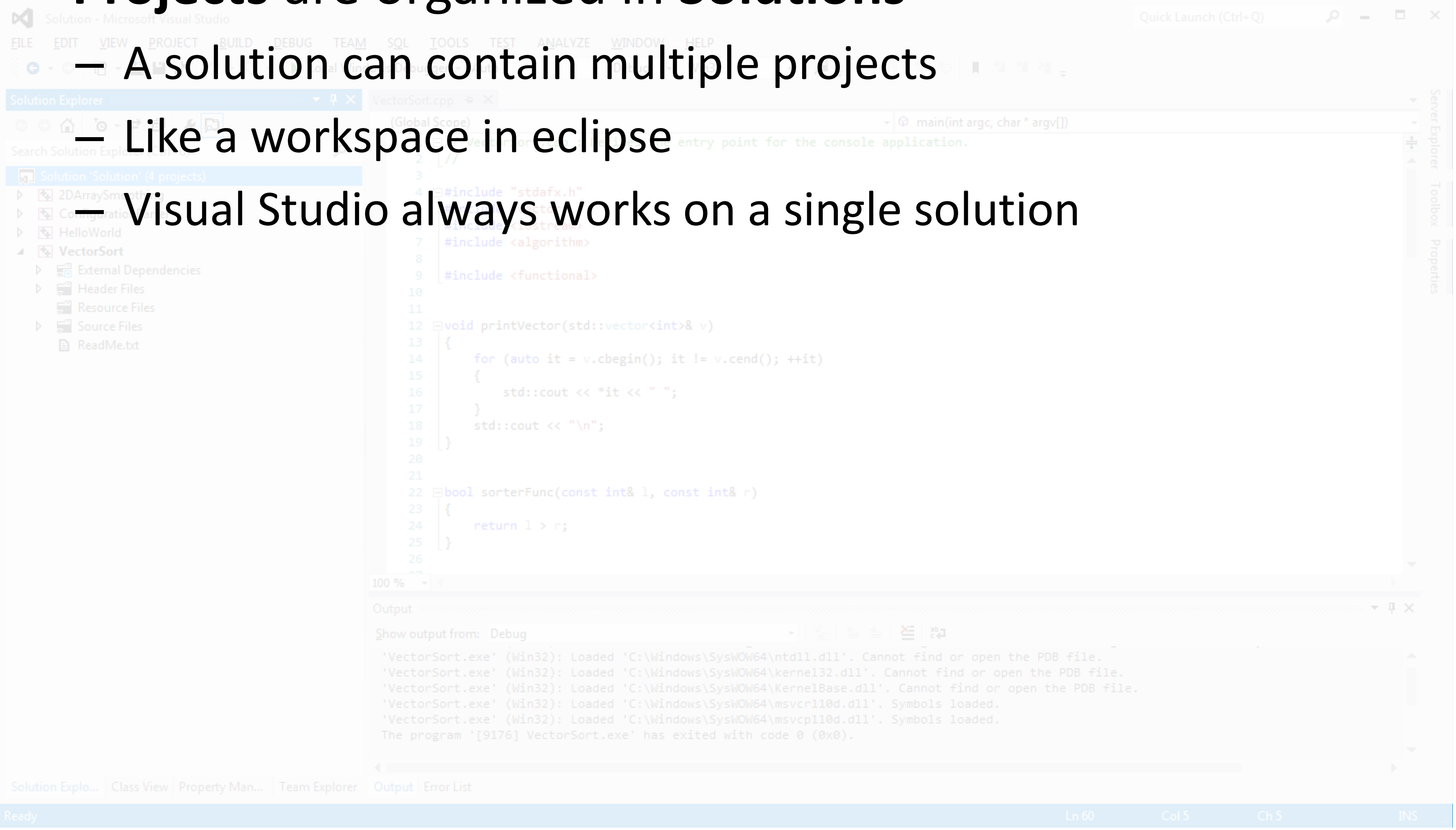

Solution - Microsoft Visual Studio
Quick Launch (Ctrl+Q)
FILE EDIT VIEW PROJECT BUILD DEBUG TEAM SQL TOOLS TEST ANALYZE WINDOW HELP
Local Windows Debugger
Auto
Debug
Win32
Solution Explorer
Search Solution Explorer (Ctrl+ü)
Solution 'Solution' (4 projects)
2DArraySmoothing
ConfigurationParser
HelloWorld
VectorSort
External Dependencies
Header Files
Resource Files
Source Files
ReadMe.txt
VectorSort.cpp
(Global Scope)
main(int argc, char * argv[])
100 %
Output
Show output from: Debug
Solution Explo... Class View Property Man... Team Explorer
Output Error List
Ready
Ln 60 Col 5 Ch 5 INS
Server Explorer
Toolbox
Properties

```cpp
// VectorSort.cpp : Defines the entry point for the console application.
//

#include "stdafx.h"
#include <vector>
#include <iostream>
#include <algorithm>

#include <functional>


void printVector(std::vector<int>& v)
{
    for (auto it = v.cbegin(); it != v.cend(); ++it)
    {
        std::cout << *it << " ";
    }
    std::cout << "\n";
}


bool sorterFunc(const int& l, const int& r)
{
    return l > r;
}

```

```
'VectorSort.exe' (Win32): Loaded 'C:\Windows\SysWOW64\ntdll.dll'. Cannot find or open the PDB file.
'VectorSort.exe' (Win32): Loaded 'C:\Windows\SysWOW64\kernel32.dll'. Cannot find or open the PDB file.
'VectorSort.exe' (Win32): Loaded 'C:\Windows\SysWOW64\KernelBase.dll'. Cannot find or open the PDB file.
'VectorSort.exe' (Win32): Loaded 'C:\Windows\SysWOW64\msvcr110d.dll'. Symbols loaded.
'VectorSort.exe' (Win32): Loaded 'C:\Windows\SysWOW64\msvcp110d.dll'. Symbols loaded.
The program '[9176] VectorSort.exe' has exited with code 0 (0x0).
```

Visual Studio

- **Projects** are organized in **Solutions**
  - A solution can contain multiple projects
  - Like a workspace in eclipse
  - Visual Studio always works on a single solution



Solution - Microsoft Visual Studio
Quick Launch (Ctrl+Q)
FILE
EDIT
VIEW
PROJECT
BUILD
DEBUG
TEAM
SQL
TOOLS
TEST
ANALYZE
WINDOW
HELP
Solution Explorer
Search Solution Explo
Solution 'Solution' (4 projects)
2DArraySm
Configuratio
HelloWorld
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    std::cout << "\n";
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'VectorSort.exe' (Win32): Loaded 'C:\Windows\SysWOW64\kernel32.dll'. Cannot find or open the PDB file.
'VectorSort.exe' (Win32): Loaded 'C:\Windows\SysWOW64\KernelBase.dll'. Cannot find or open the PDB file.
'VectorSort.exe' (Win32): Loaded 'C:\Windows\SysWOW64\msvcr110d.dll'. Symbols loaded.
'VectorSort.exe' (Win32): Loaded 'C:\Windows\SysWOW64\msvcp110d.dll'. Symbols loaded.
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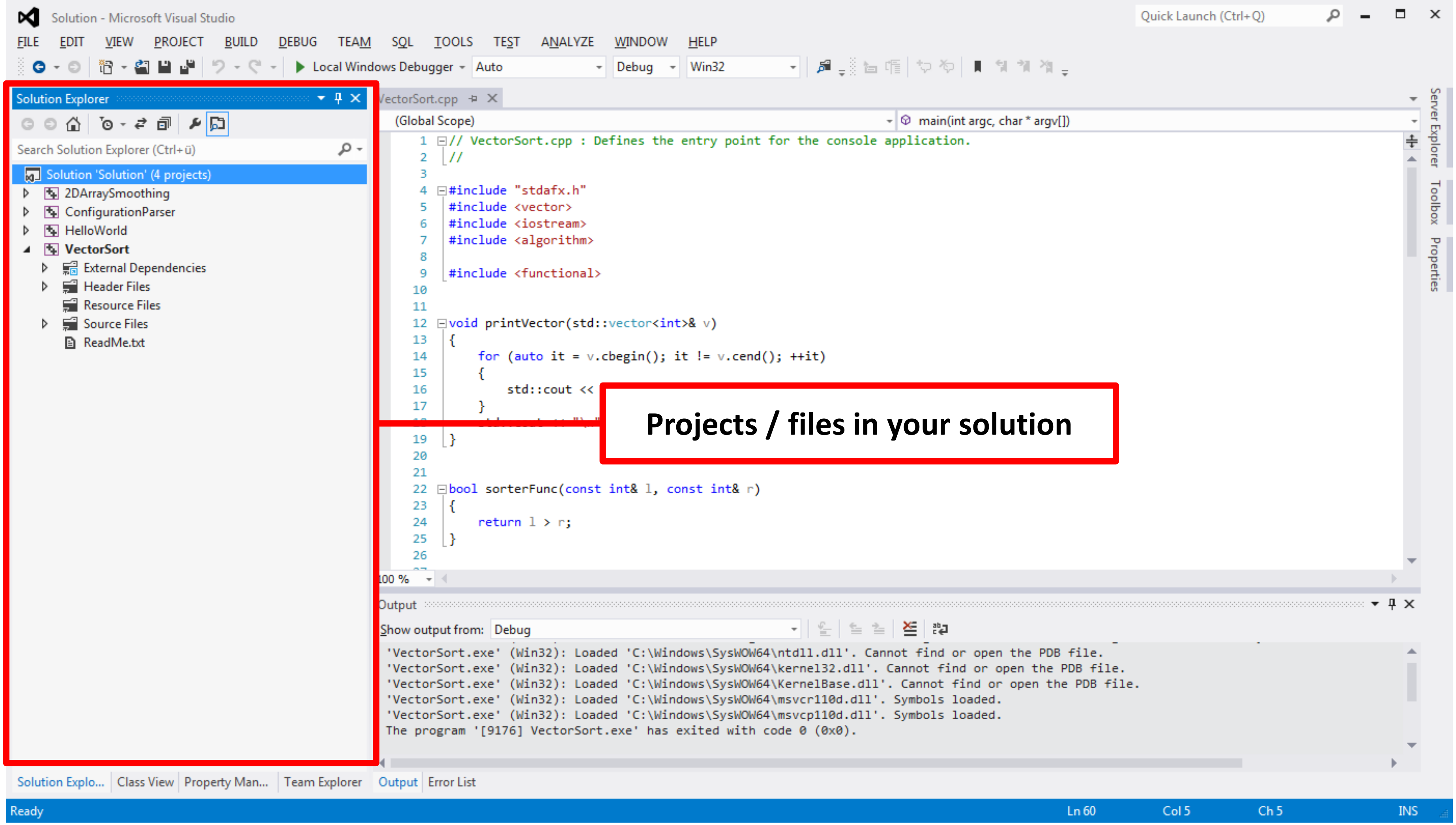
Visual Studio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Output
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Ready
Ln 60
Col 5
Ch 5
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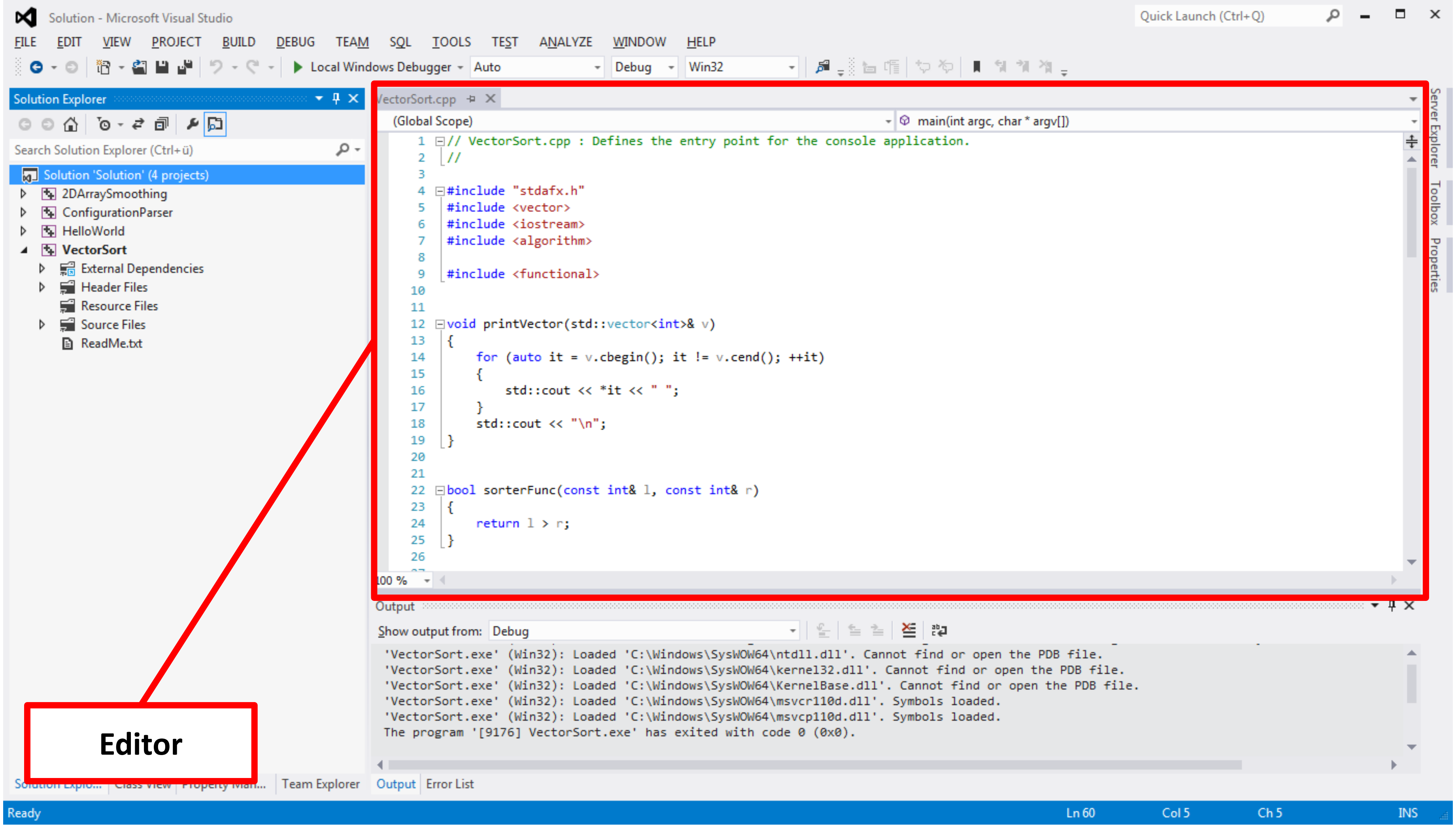
```
// VectorSort.cpp : Defines the entry point for the console application.
//

#include "stdafx.h"
#include <vector>
#include <iostream>
#include <algorithm>

#include <functional>


void printVector(std::vector<int>& v)
{
    for (auto it = v.cbegin(); it != v.cend(); ++it)
    {
        std::cout <<
    }

}


bool sorterFunc(const int& l, const int& r)
{
    return l > r;
}
```

```
'VectorSort.exe' (Win32): Loaded 'C:\Windows\SysWOW64\ntdll.dll'. Cannot find or open the PDB file.
'VectorSort.exe' (Win32): Loaded 'C:\Windows\SysWOW64\kernel32.dll'. Cannot find or open the PDB file.
'VectorSort.exe' (Win32): Loaded 'C:\Windows\SysWOW64\KernelBase.dll'. Cannot find or open the PDB file.
'VectorSort.exe' (Win32): Loaded 'C:\Windows\SysWOW64\msvcr110d.dll'. Symbols loaded.
'VectorSort.exe' (Win32): Loaded 'C:\Windows\SysWOW64\msvcp110d.dll'. Symbols loaded.
The program '[9176] VectorSort.exe' has exited with code 0 (0x0).
```

Projects / files in your solution

Visual Studio


Solution - Microsoft Visual Studio
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FILE
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TEAM
SQL
TOOLS
TEST
ANALYZE
WINDOW
HELP
Local Windows Debugger
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Search Solution Explorer (Ctrl+ü)
Solution 'Solution' (4 projects)
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Header Files
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Source Files
ReadMe.txt
VectorSort.cpp
(Global Scope)
main(int argc, char * argv[])
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Show output from: Debug
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Class View
Property Man...
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Output
Error List
Ready
Ln 60
Col 5
Ch 5
INS

```cpp
// VectorSort.cpp : Defines the entry point for the console application.
//

#include "stdafx.h"
#include <vector>
#include <iostream>
#include <algorithm>

#include <functional>


void printVector(std::vector<int>& v)
{
    for (auto it = v.cbegin(); it != v.cend(); ++it)
    {
        std::cout << *it << " ";
    }
    std::cout << "\n";
}


bool sorterFunc(const int& l, const int& r)
{
    return l > r;
}

```

```
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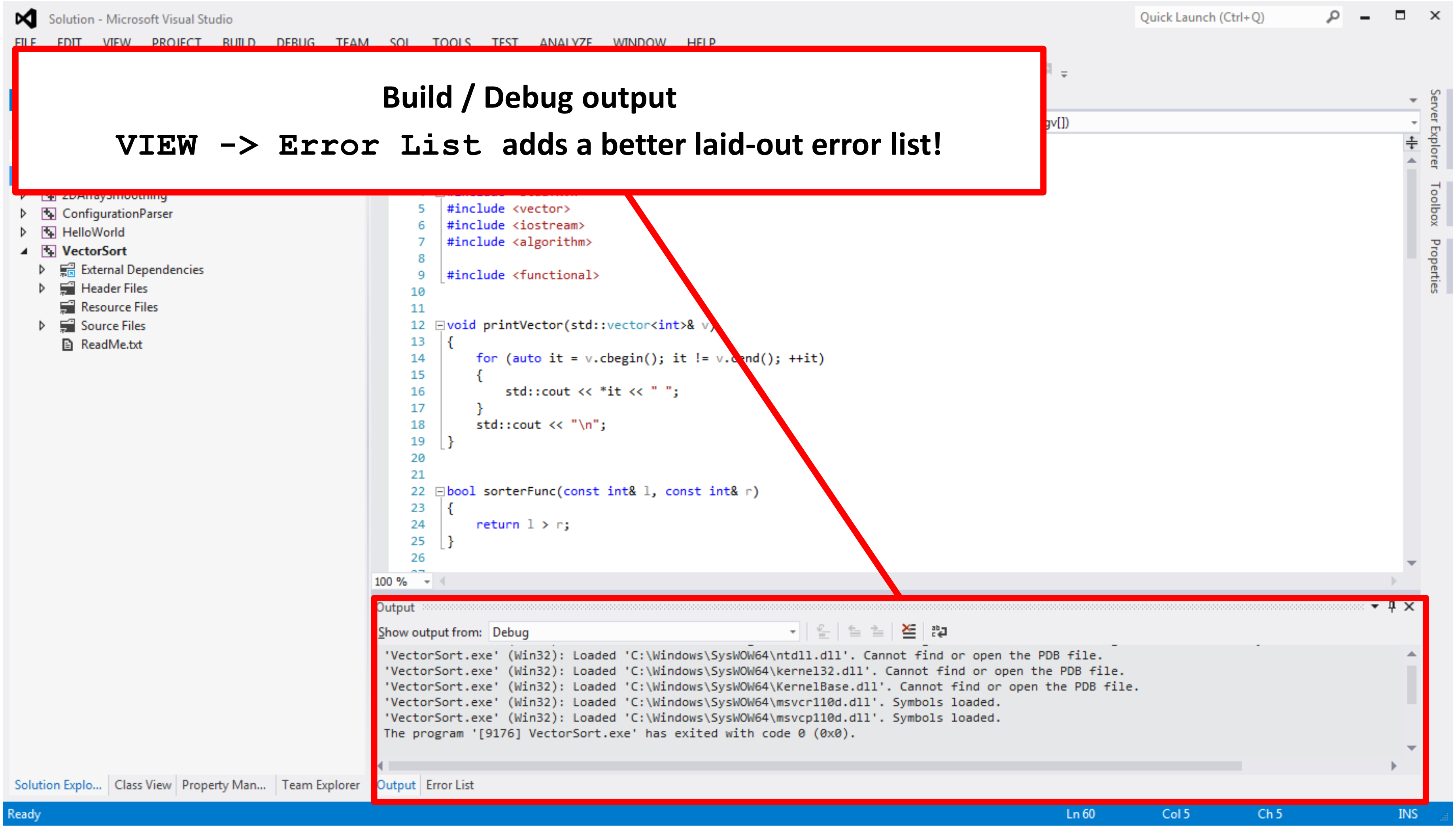
The program '[9176] VectorSort.exe' has exited with code 0 (0x0).
```

Editor

Visual Studio


Solution - Microsoft Visual Studio
Quick Launch (Ctrl+Q)
FILE EDIT VIEW PROJECT BUILD DEBUG TEAM SQL TOOLS TEST ANALYZE WINDOW HELP
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ConfigurationParser
HelloWorld
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100 %
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Show output from: Debug
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Team Explorer
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Error List
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Ch 5
INS

Build / Debug output

`VIEW -> Error List` adds a better laid-out error list!

```
#include <vector>
#include <iostream>
#include <algorithm>

#include <functional>


void printVector(std::vector<int>& v)
{
    for (auto it = v.cbegin(); it != v.cend(); ++it)
    {
        std::cout << *it << " ";
    }
    std::cout << "\n";
}


bool sorterFunc(const int& l, const int& r)
{
    return l > r;
}

```

```
'VectorSort.exe' (Win32): Loaded 'C:\Windows\SysWOW64\ntdll.dll'. Cannot find or open the PDB file.
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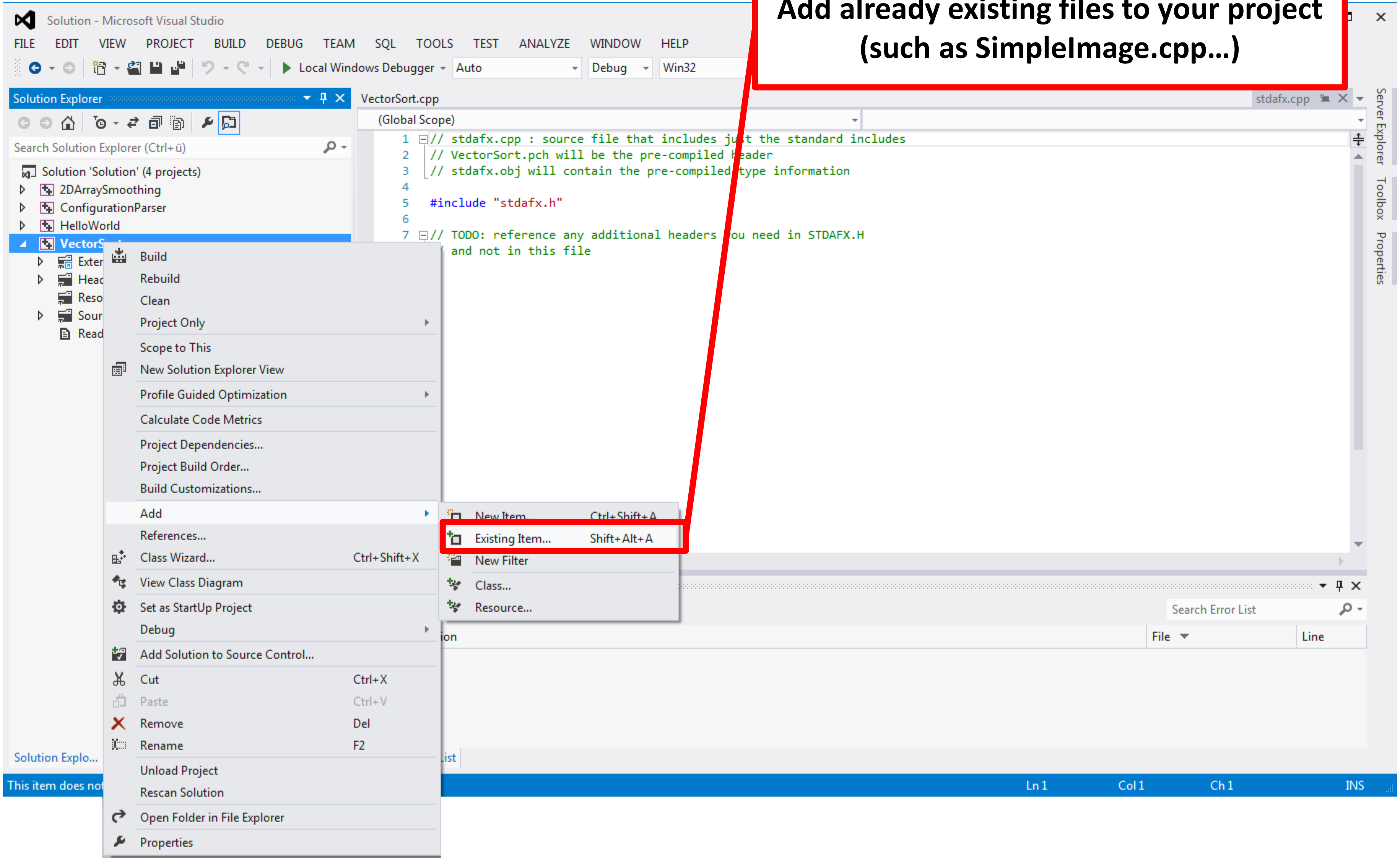
The program '[9176] VectorSort.exe' has exited with code 0 (0x0).
```

Visual Studio

Add already existing files to your project (such as SimpleImage.cpp…)



```
// stdafx.cpp : source file that includes just the standard includes
// VectorSort.pch will be the pre-compiled header
// stdafx.obj will contain the pre-compiled type information

#include "stdafx.h"

// TODO: reference any additional headers you need in STDAFX.H
// and not in this file
```

Solution - Microsoft Visual Studio
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Read
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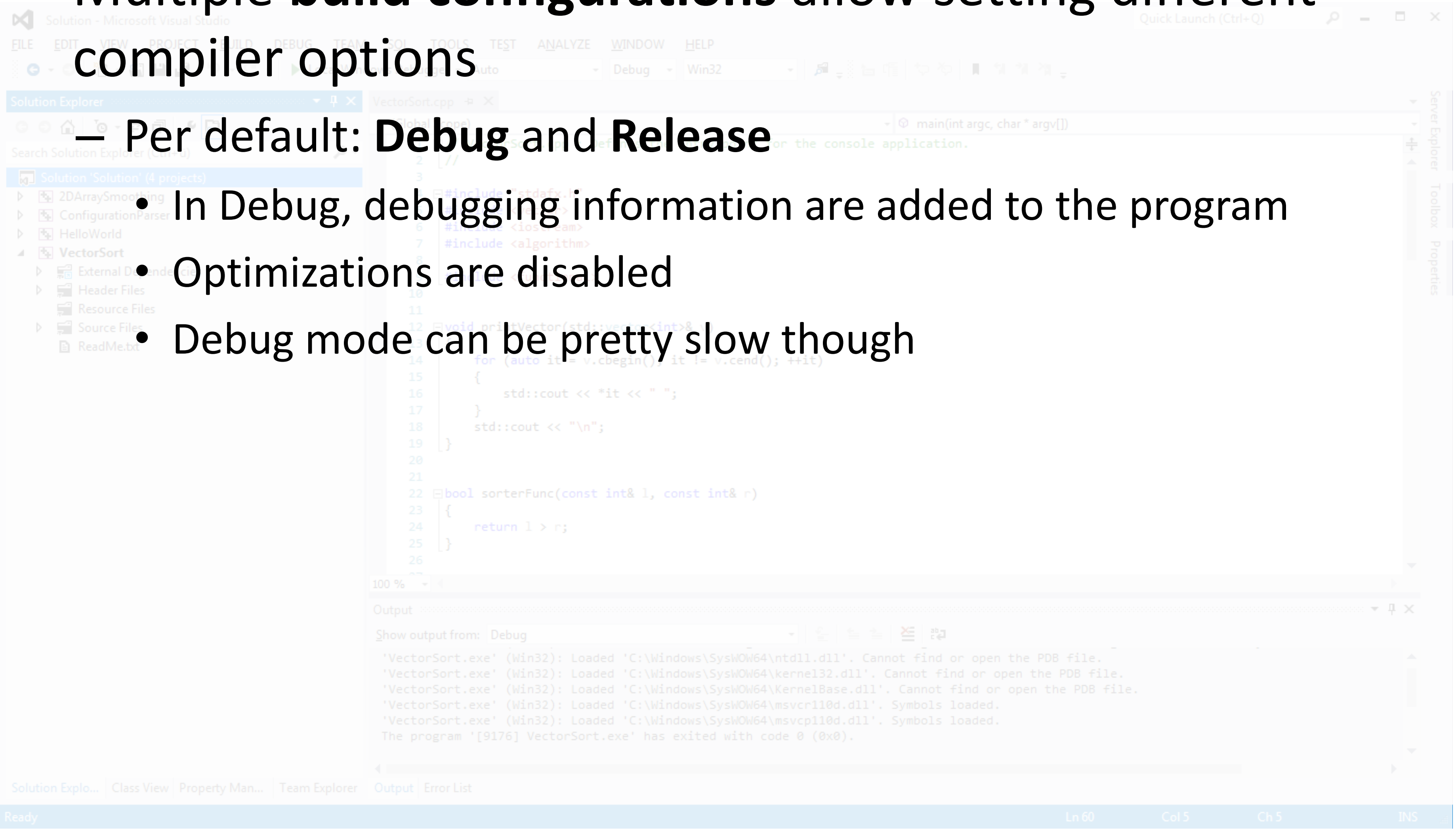
Rebuild
Clean
Project Only
Scope to This
New Solution Explorer View
Profile Guided Optimization
Calculate Code Metrics
Project Dependencies...
Project Build Order...
Build Customizations...
Add
References...
Class Wizard... Ctrl+Shift+X
View Class Diagram
Set as StartUp Project
Debug
Add Solution to Source Control...
Cut Ctrl+X
Paste Ctrl+V
Remove Del
Rename F2
Unload Project
Rescan Solution
Open Folder in File Explorer
Properties
New Item... Ctrl+Shift+A
Existing Item... Shift+Alt+A
New Filter
Class...
Resource...
Search Error List
ion
File
Line
Solution Explo...
ist
This item does not
Ln 1
Col 1
Ch 1
INS

Visual Studio

- Multiple **build configurations** allow setting different compiler options
  - Per default: **Debug** and **Release**
    - In Debug, debugging information are added to the program
    - Optimizations are disabled
    - Debug mode can be pretty slow though


Solution - Microsoft Visual Studio
FILE EDIT VIEW PROJECT BUILD DEBUG TEAM SQL TOOLS TEST ANALYZE WINDOW HELP
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(Global Scope)
main(int argc, char * argv[])
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Team Explorer
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INS

```
void printVector(std::vector<int>& v)
{
    for (auto it = v.cbegin(); it != v.cend(); ++it)
    {
        std::cout << *it << " ";
    }
    std::cout << "\n";
}


bool sorterFunc(const int& l, const int& r)
{
    return l > r;
}
```

Show output from: Debug

```
'VectorSort.exe' (Win32): Loaded 'C:\Windows\SysWOW64\ntdll.dll'. Cannot find or open the PDB file.
'VectorSort.exe' (Win32): Loaded 'C:\Windows\SysWOW64\kernel32.dll'. Cannot find or open the PDB file.
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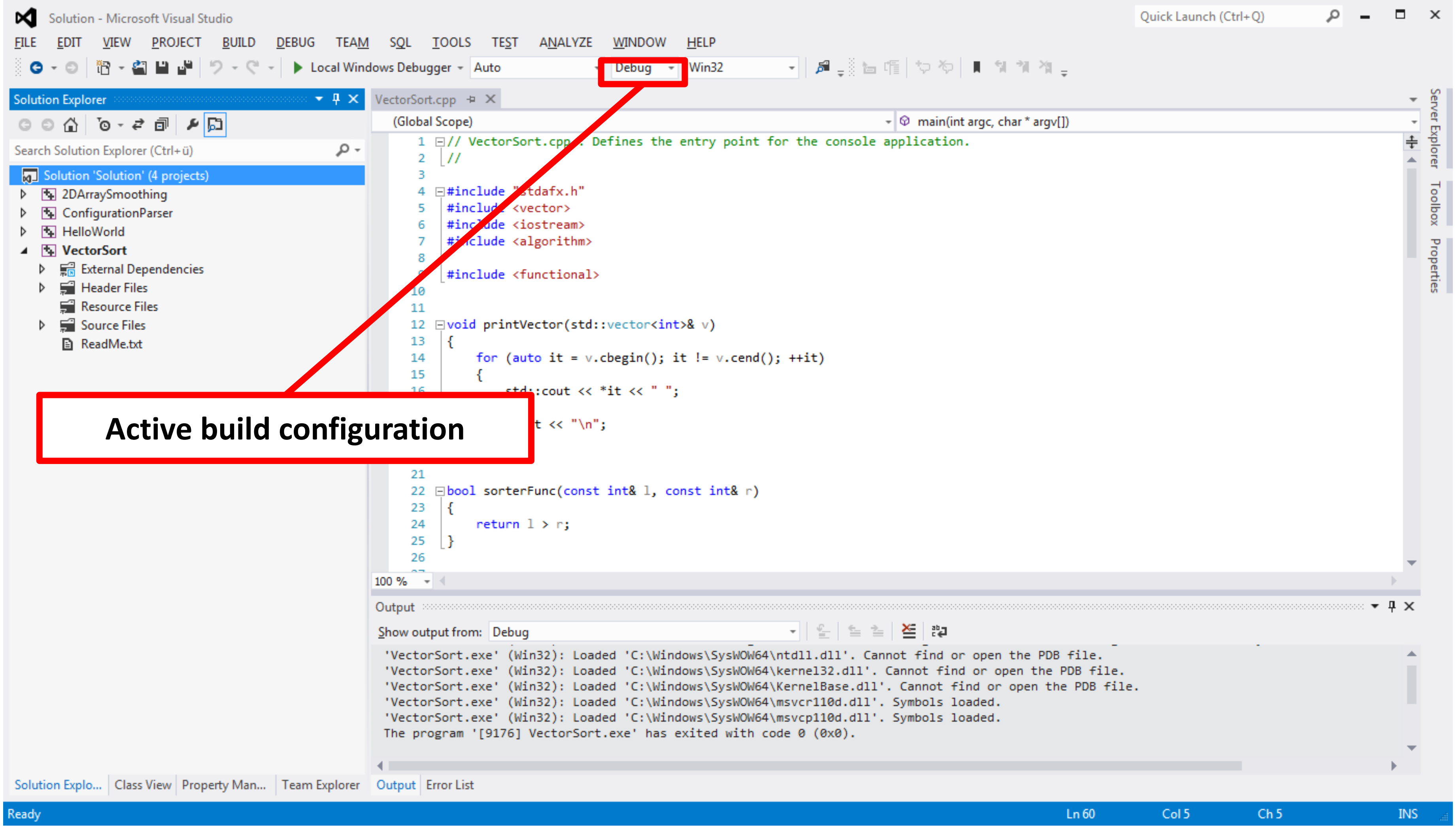
Visual Studio


Solution - Microsoft Visual Studio
Quick Launch (Ctrl+Q)
FILE EDIT VIEW PROJECT BUILD DEBUG TEAM SQL TOOLS TEST ANALYZE WINDOW HELP
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(Global Scope)
main(int argc, char * argv[])
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```
// VectorSort.cpp : Defines the entry point for the console application.
//

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#include <algorithm>

#include <functional>


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{
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    {
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                 t << "\n";


bool sorterFunc(const int& l, const int& r)
{
    return l > r;
}

```

```
'VectorSort.exe' (Win32): Loaded 'C:\Windows\SysWOW64\ntdll.dll'. Cannot find or open the PDB file.
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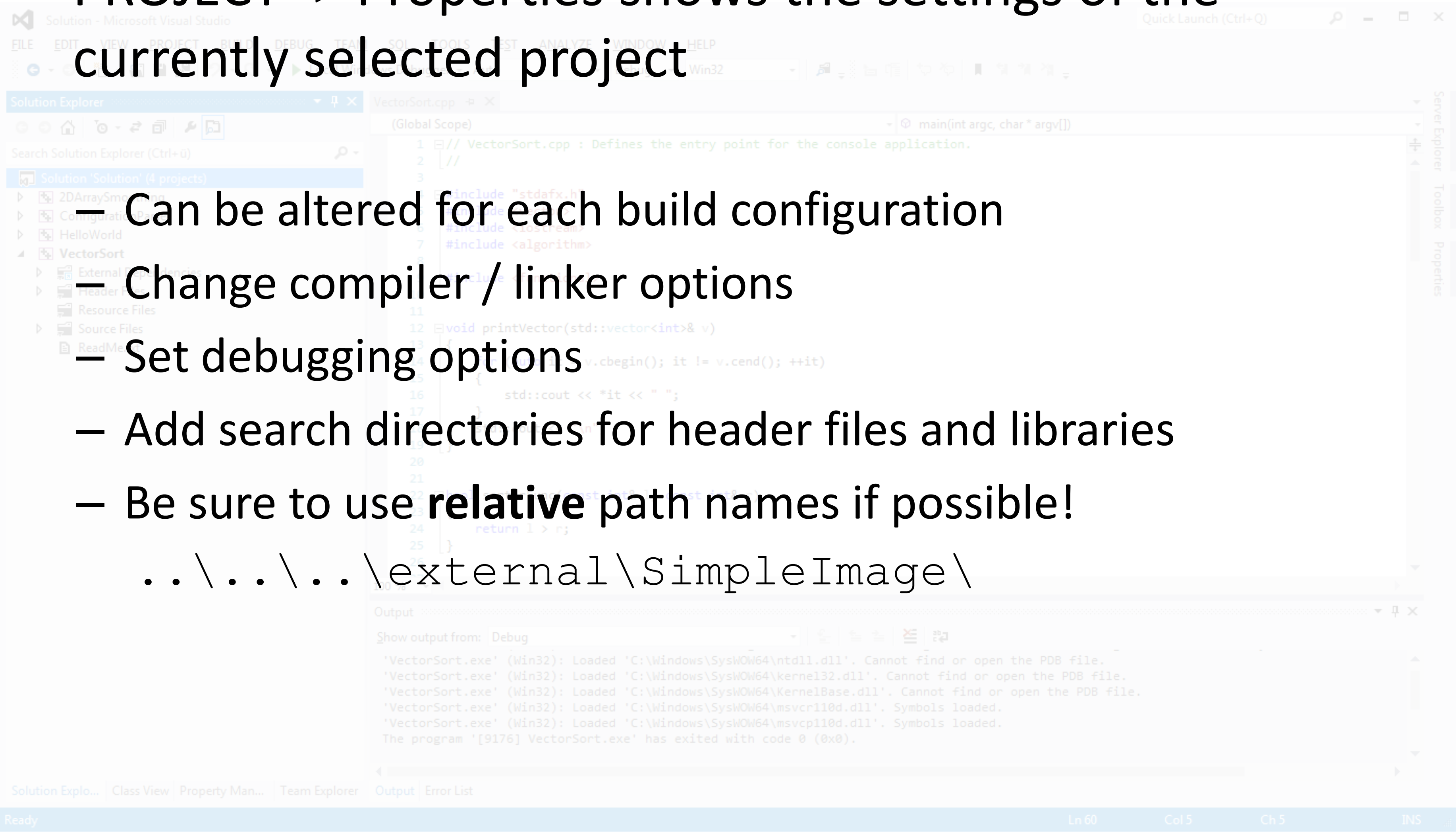
'VectorSort.exe' (Win32): Loaded 'C:\Windows\SysWOW64\msvcp110d.dll'. Symbols loaded.
The program '[9176] VectorSort.exe' has exited with code 0 (0x0).
```

Active build configuration

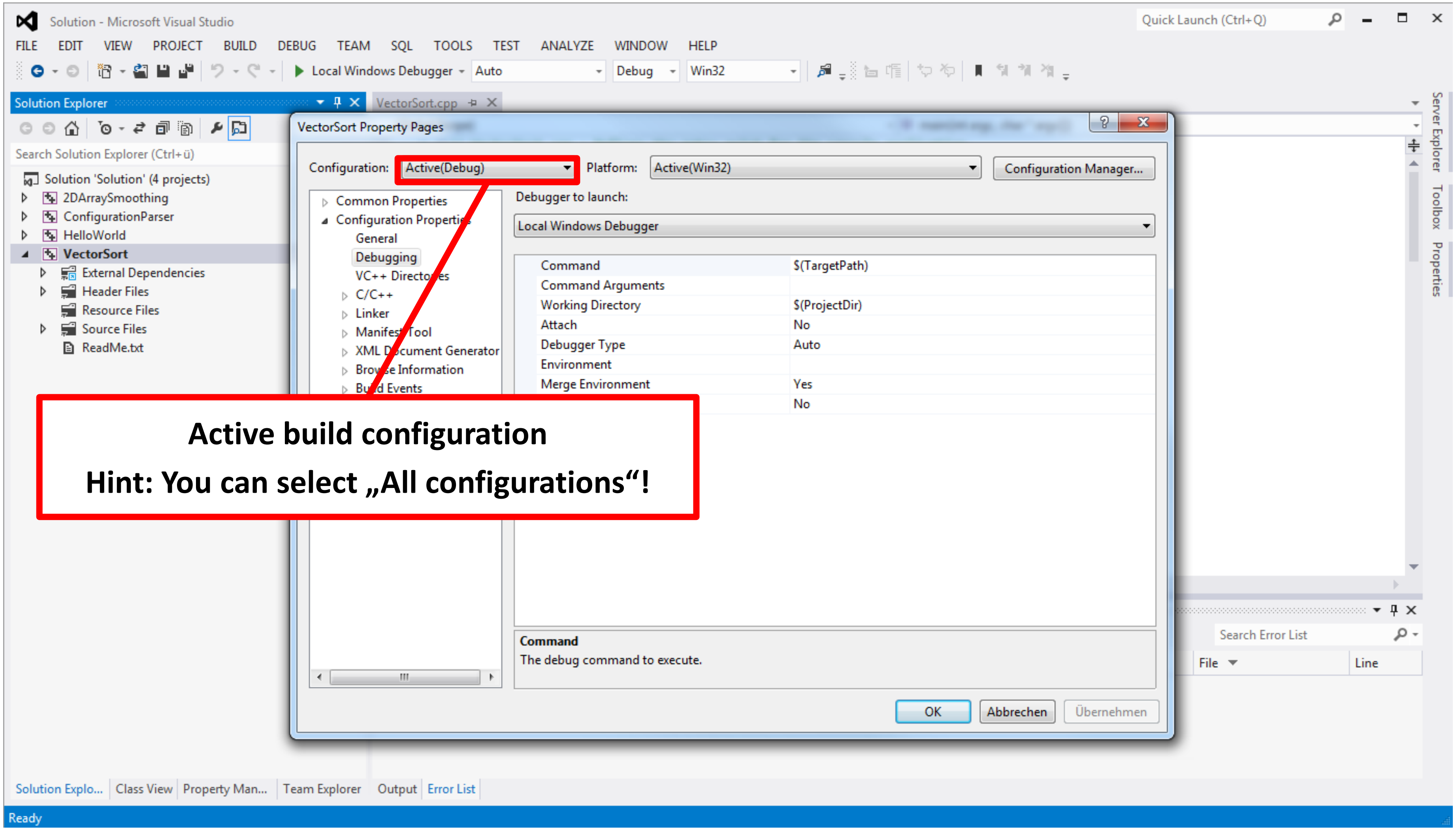
Visual Studio



- PROJECT -> Properties shows the settings of the currently selected project
  - Can be altered for each build configuration
  - Change compiler / linker options
  - Set debugging options
  - Add search directories for header files and libraries
  - Be sure to use **relative** path names if possible!

    `..\..\..\external\SimpleImage\`

Visual Studio


Solution - Microsoft Visual Studio
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Linker
Manifest Tool
XML Document Generator
Browse Information
Build Events
OK
Abbrechen
Übernehmen
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Error List
Ready

Configuration: Active(Debug)

Platform: Active(Win32)

Debugger to launch: Local Windows Debugger

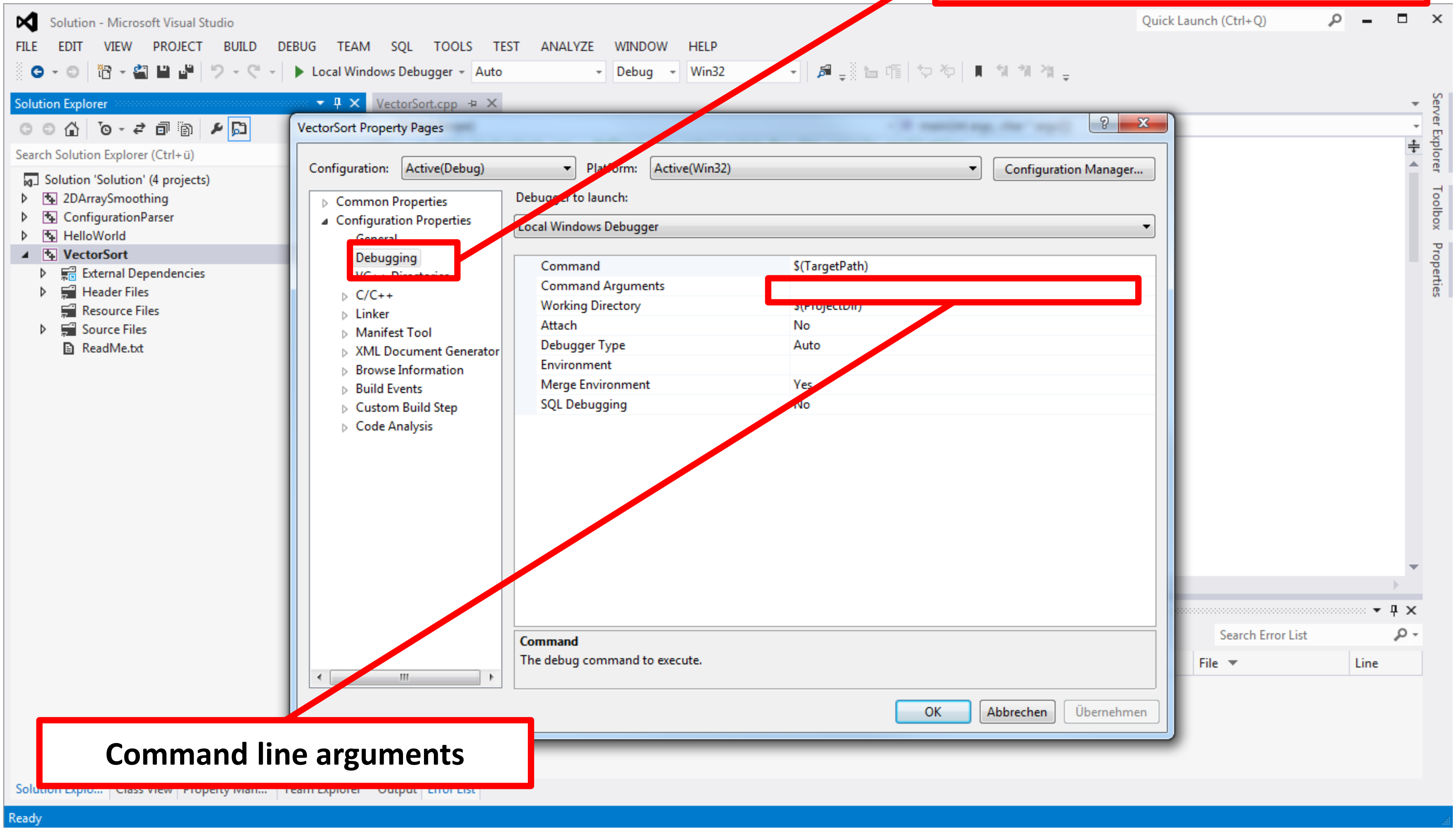
Command	$(TargetPath)
Command Arguments	
Working Directory	$(ProjectDir)
Attach	No
Debugger Type	Auto
Environment	
Merge Environment	Yes
	No

Command
The debug command to execute.

Active build configuration

Hint: You can select „All configurations“!

Visual Studio



Debugging options

Command line arguments

VectorSort Property Pages

Configuration: Active(Debug)

Platform: Active(Win32)

Debugger to launch: Local Windows Debugger

Command	$(TargetPath)
Command Arguments	
Working Directory	$(ProjectDir)
Attach	No
Debugger Type	Auto
Environment	
Merge Environment	Yes
SQL Debugging	No

Command
The debug command to execute.

Solution - Microsoft Visual Studio
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Manifest Tool
XML Document Generator
Browse Information
Build Events
Custom Build Step
Code Analysis
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Abbrechen
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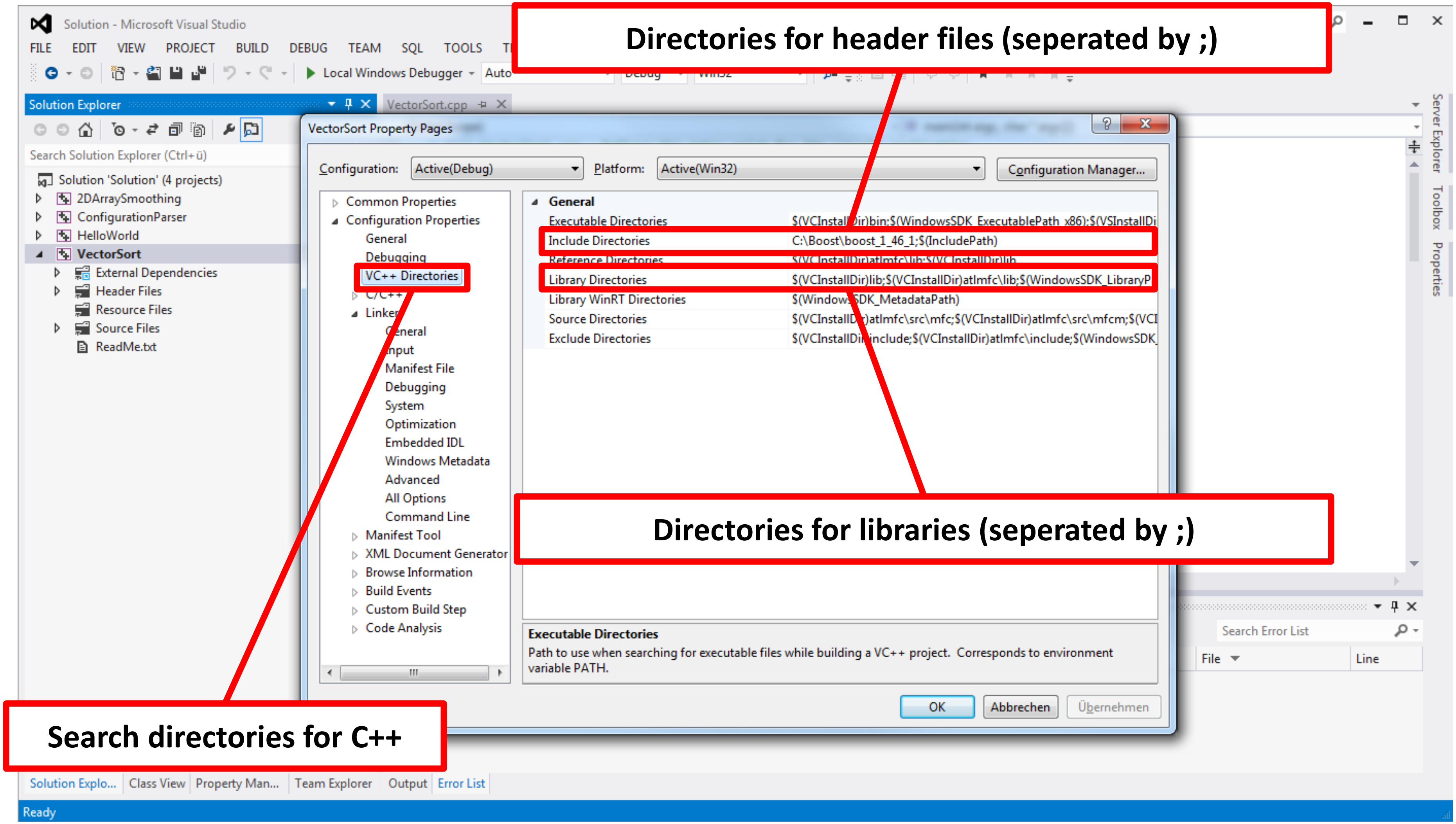
Visual Studio


Solution - Microsoft Visual Studio
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Configuration: Active(Debug)

Platform: Active(Win32)

Configuration Manager...

General

Executable Directories	$(VCInstallDir)bin;$(WindowsSDK_ExecutablePath_x86);$(VSInstallDi
Include Directories	C:\Boost\boost_1_46_1;$(IncludePath)
Reference Directories	$(VCInstallDir)atlmfc\lib;$(VCInstallDir)lib
Library Directories	$(VCInstallDir)lib;$(VCInstallDir)atlmfc\lib;$(WindowsSDK_LibraryP
Library WinRT Directories	$(WindowsSDK_MetadataPath)
Source Directories	$(VCInstallDir)atlmfc\src\mfc;$(VCInstallDir)atlmfc\src\mfcm;$(VCI
Exclude Directories	$(VCInstallDir)include;$(VCInstallDir)atlmfc\include;$(WindowsSDK_

Executable Directories

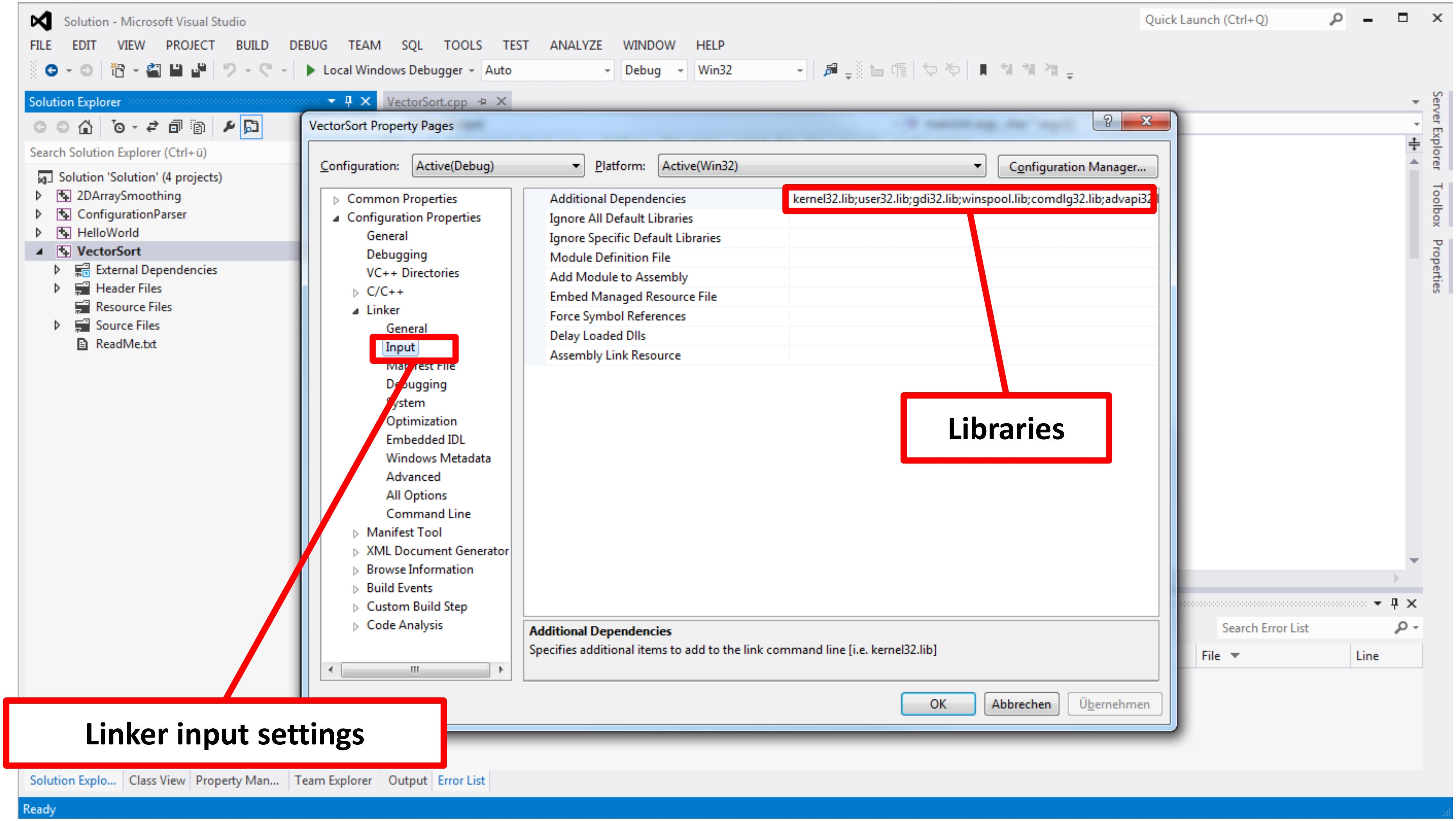
Path to use when searching for executable files while building a VC++ project. Corresponds to environment variable PATH.

Directories for header files (seperated by ;)

Directories for libraries (seperated by ;)

Search directories for C++

Visual Studio


Solution - Microsoft Visual Studio
Quick Launch (Ctrl+Q)
FILE EDIT VIEW PROJECT BUILD DEBUG TEAM SQL TOOLS TEST ANALYZE WINDOW HELP
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Manifest Tool
XML Document Generator
Browse Information
Build Events
Custom Build Step
Code Analysis
Ignore All Default Libraries
Ignore Specific Default Libraries
Module Definition File
Add Module to Assembly
Embed Managed Resource File
Force Symbol References
Delay Loaded Dlls
Assembly Link Resource
OK
Abbrechen
Übernehmen
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Ready

Configuration: Active(Debug)

Platform: Active(Win32)

Additional Dependencies: kernel32.lib;user32.lib;gdi32.lib;winspool.lib;comdlg32.lib;advapi32

Additional Dependencies
Specifies additional items to add to the link command line [i.e. kernel32.lib]

Libraries

Linker input settings

Questions?