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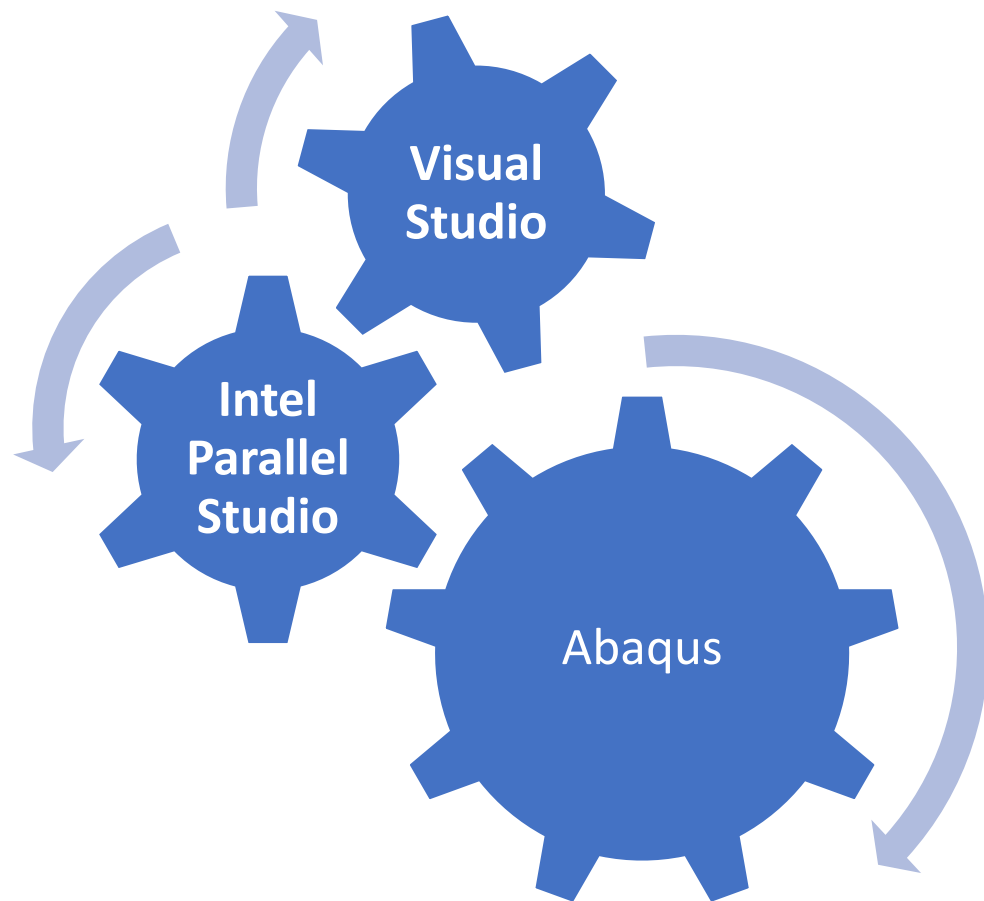


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# Linking ABAQUS with FORTRAN



*Step by step guide by Sia Nourani*

Most combinations of ABAQUS and FORTRAN are possible, however you may deal with some errors and limitations. It depends on your available hardware and software. Reference to supported platforms list by DESSAULT SYSTEMS, Visual Studio 2017 or above and Intel Visual Fortran Compiler 16.0 or above are the most compatible versions with ABAQUS 2020.

This instruction will guide you to link ABAQUS 2020 and FORTRAN on WINDOWS 10. The process should be the same albeit with slightly different file names and directories:

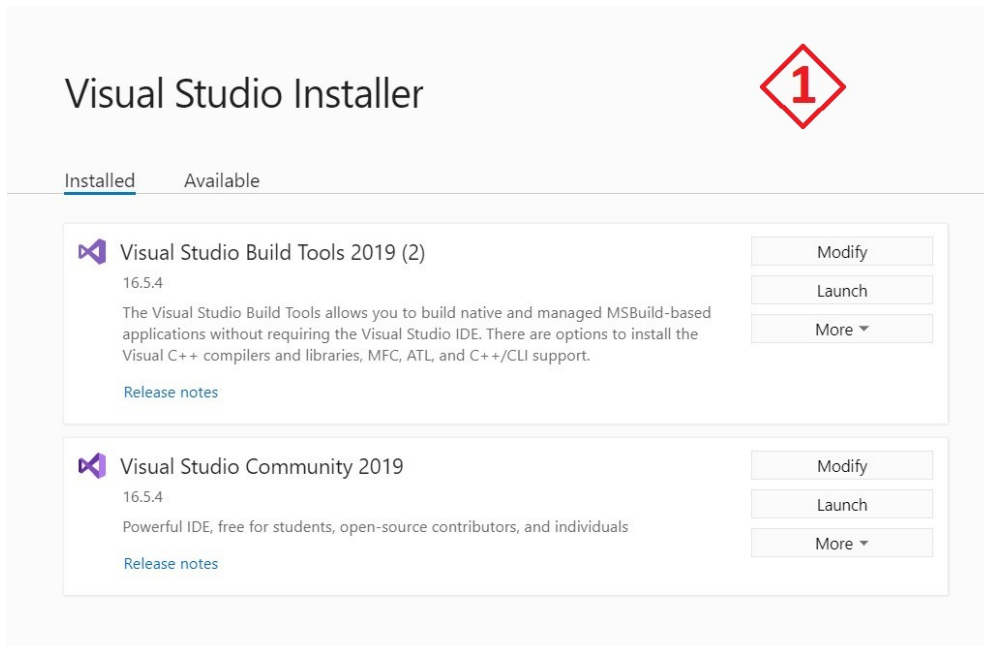
## Step 1: Installation

Install your copy of SIMULIA ABAQUS (**NOT student license**) followed by Visual Studio and Visual Fortran. Make sure you install **C++ component** of Visual Studio as well. (student versions are free)

### 1.1. Installing Visual Studio Community 2019 with latest update

go to Microsoft Visual Studio webpage (the below link), sign up and download the installer. Following this, install Visual Studio and Visual Studio Build Tools:

<https://docs.microsoft.com/en-us/visualstudio/install/install-visual-studio?view=vs-2019>



The screenshot shows the Visual Studio Installer window. At the top, it says "Visual Studio Installer" with a red diamond icon containing the number "1". Below the title bar, there are two tabs: "Installed" (which is selected) and "Available". The main area displays two installed components:

- Visual Studio Build Tools 2019 (2)** (version 16.5.4): The description states it allows building native and managed MSBuild-based applications without the Visual Studio IDE. It includes options for Visual C++ compilers and libraries, MFC, ATL, and C++/CLI support. Buttons for "Modify", "Launch", and "More" are visible.
- Visual Studio Community 2019** (version 16.5.4): The description states it is a powerful IDE, free for students, open-source contributors, and individuals. Buttons for "Modify", "Launch", and "More" are visible.

Modifying — Visual Studio Community 2019 — 16.5.4

Workloads Individual components Language packs Installation locations

Web & Cloud (4)

- ASP.NET and web development 
  - Build web applications using ASP.NET Core, ASP.NET, HTML/JavaScript, and Containers including Docker support.
- Python development 
  - Editing, debugging, interactive development and source control for Python.
- Azure development 
  - Azure SDKs, tools, and projects for developing cloud apps and creating resources using .NET Core and .NET...
- Node.js development 
  - Build scalable network applications using Node.js, an asynchronous event-driven JavaScript runtime.

Desktop & Mobile (5)

- .NET desktop development 
  - Build WPF, Windows Forms, and console applications using C#, Visual Basic, and F# with .NET Core and .NET...
- Desktop development with C++ 
  - Build modern C++ apps for Windows using tools of your choice, including MSVC, Clang, CMake, or MSBuild.
- Universal Windows Platform development 
  - Create applications for the Universal Windows Platform with C#, VB, or optionally C++.
- Mobile development with .NET 
  - Build cross-platform applications for iOS, Android or Windows using Xamarin.
- Mobile development with C++ 
  - Build cross-platform applications for iOS, Android or Windows using C++.

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Modifying — Visual Studio Build Tools 2019 (2) — 16.5.4

Workloads Individual components Language packs Installation locations

Desktop & Mobile (4)

- C++ build tools 
  - Build Windows desktop applications using the Microsoft C++ toolset, ATL, or MFC.
- .NET desktop build tools 
  - Tools for building WPF, Windows Forms, and console applications using C#, Visual Basic, and F#.
- Mobile Development with .NET 
  - Tools for building cross-platform applications for iOS, Android and Windows using C# and F#.
- Universal Windows Platform build tools 
  - Provides the tools required to build Universal Windows Platform applications.

Web & Cloud (4)

- Web development build tools 
  - MSBuild tasks and targets for building web applications.
- Azure development build tools 
  - MSBuild tasks and targets for building Azure applications.
- Office/SharePoint build tools 
  - Build Office and SharePoint add-ins, and VSTO add-ins.
- Data storage and processing build tools 
  - Data storage and processing build tools
  - Build SQL Server Database Projects

Uncategorized (1)

- Node.js build tools 
  - MSBuild tasks and targets for building scalable network applications using Node.js, an asynchronous event-driven...

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## 1.2. Installing Intel Parallel Studio XE 2020 - Cluster Edition for Windows

Intel Fortran Compiler is available only within the Intel Parallel Studio XE suite of products. go to Intel Parallel Studio XE website (the below link), sign up and install the latest version of Intel Parallel Studio XE as below:

- Verify that you qualify for the student offer.
- Make sure your system meets the minimum system requirements listed on this page.
- Complete the registration form. Once your student status is verified, you will receive an email with the download links.

Products Solutions Support 

### Intel® Parallel Studio XE Cluster Edition for Windows\* 2020

You have registered **Intel® Parallel Studio XE Cluster Edition for Windows\*** for non-commercial use. You will receive an email with the serial number listed below and the download location for future reference.

Serial number : XXXXXXXXXX

- Save this serial number. You may need it to activate your product in the installer.
- For your reference, you will receive an email that includes your serial number and download instructions.

Choose a Version  
2020 Update 1 

Build date:01 Apr 2020  
[Release Notes](#) | [ReadMe](#) | [Installation Guide](#)

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## 1.3. Installing ABAQUS 2020 with update

Following this, install ABAQUS 2020 with last update HF1. It works fine even If you already installed ABAQUS.

## Step 2: linking

There are different ways to link ABAQUS & FORTRAN. However, I believe that below method is the most secure and easy one; and it works perfectly (paths will probably change for your specific computer). you just need to edit abq2020.bat: \*contents below\*

```
SET PATH=%PATH%;C:\Program Files
(x86)\IntelSWTools\compilers_and_libraries_2020.1.216\windows\bin\intel64;

call "C:\Program Files (x86)\IntelSWTools\compilers_and_libraries_2020.1.216\windows\bin\ifortvars" -
arch intel64

call "C:\Program Files
(x86)\IntelSWTools\compilers_and_libraries_2020.1.216\windows\mkl\bin\mklvars" intel64

@echo off

rem setlocal

rem set ABA_COMMAND=%~nx0

rem set ABA_COMMAND_FULL=%~f0

"C:\SIMULIA\EstProducts\2020\win_b64\code\bin\ABQLauncher.exe" %*

rem endlocal
```

### Step 3: Run ABAQUS Verification

- Run “Abaqus Verification” as administrator. Results will be saved to C:\WINDOWS\SysWOW64\verify.log. This file shows the verifications, if ABAQUS linked with FORTRAN successfully in verify text file, in section Abaqus/Standard with user subroutines, you can observe “...pass” it means that you linked ABAQUS with FORTRAN successfully.

```
verify.log - Notepad
File Edit Format View Help
Abaqus Product Install Verification...
[REDACTED]
Making C:\WINDOWS\SysWOW64\verify. All verification files will reside in
this directory.
-----
Abaqus/Standard
    ...PASS
    Continuing...
-----
Abaqus/Standard with user subroutines
    ...PASS
    Continuing...
-----
```



- Run “Abaqus CAE” and make sure that you link it correctly as below figure:

```
Intel Compiler 19.1 Update 1 Intel(R) 64
Intel(R) MPI Library 2019 Update 7 for Windows* Target Build Environment for Intel(R) 64 applications
Copyright 2007-2020 Intel Corporation.

Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) Compiler 19.1 Update 1 (package 216)

*****
** Visual Studio 2019 Developer Command Prompt v16.5.4
** Copyright (c) 2019 Microsoft Corporation
*****
[vcvarsall.bat] Environment initialized for: 'x64'
```

## References:

<https://www.3ds.com/>

<https://www.youtube.com/watch?v=qGNAdIDoeTs>

<https://www.youtube.com/watch?v=k3EtSQE-AH0>

[https://www.researchgate.net/deref/http%3A%2F%2Fdx.doi.org%2F10.13140%2FRG.2.2.26845.56802?\\_sg%5B0%5D=6Nem4iQu2-PbYRm6RZMU95oD75bqA\\_Ov0e\\_0he-ybAs76VxyKBAacmlO4b9-OO2vRrBNY7Jfc8vsY4-yE7O7Qt3MA.4uuFM9QxkOBYPMJ9jJJVVjCc-rATioX3fHtSWRU3C-fXCyfXtEP658aYMnP5hE\\_YVduBIVDInte\\_lcMXFZ9J1A](https://www.researchgate.net/deref/http%3A%2F%2Fdx.doi.org%2F10.13140%2FRG.2.2.26845.56802?_sg%5B0%5D=6Nem4iQu2-PbYRm6RZMU95oD75bqA_Ov0e_0he-ybAs76VxyKBAacmlO4b9-OO2vRrBNY7Jfc8vsY4-yE7O7Qt3MA.4uuFM9QxkOBYPMJ9jJJVVjCc-rATioX3fHtSWRU3C-fXCyfXtEP658aYMnP5hE_YVduBIVDInte_lcMXFZ9J1A)

[https://www.researchgate.net/publication/336115366\\_Linking\\_ABAQUS\\_with\\_FORTRAN\\_user\\_manual?enrichId=rgreq-793a63db0364a2001d05173f64128f70-XXX&enrichSource=Y292ZXJQYWdlOzMzNjExNTM2NjtBUzo4MDgwMjc4MjExODI5NzhAMTU2OTY2MDI1MzY4MQ%3D%3D&el=1\\_x\\_2&\\_esc=publicationCoverPdf](https://www.researchgate.net/publication/336115366_Linking_ABAQUS_with_FORTRAN_user_manual?enrichId=rgreq-793a63db0364a2001d05173f64128f70-XXX&enrichSource=Y292ZXJQYWdlOzMzNjExNTM2NjtBUzo4MDgwMjc4MjExODI5NzhAMTU2OTY2MDI1MzY4MQ%3D%3D&el=1_x_2&_esc=publicationCoverPdf)

[https://www.researchgate.net/publication/340005387\\_Linking\\_ABAQUS\\_2019\\_with\\_FORTRAN](https://www.researchgate.net/publication/340005387_Linking_ABAQUS_2019_with_FORTRAN)

[https://www.researchgate.net/publication/328981424\\_Guide\\_to\\_Link\\_ABAQUS\\_2017\\_with\\_FORTRAN?enrichId=rgreq-e5451ae37e818d80c4f4c17838748ce7-XXX&enrichSource=Y292ZXJQYWdlOzMzNDk4MTQyNDtBUzo2OTM1MjM4NDIwOTMwNTZAMTU0MjM2MDM3NzA0MA%3D%3D&el=1\\_x\\_2&\\_esc=publicationCoverPdf](https://www.researchgate.net/publication/328981424_Guide_to_Link_ABAQUS_2017_with_FORTRAN?enrichId=rgreq-e5451ae37e818d80c4f4c17838748ce7-XXX&enrichSource=Y292ZXJQYWdlOzMzNDk4MTQyNDtBUzo2OTM1MjM4NDIwOTMwNTZAMTU0MjM2MDM3NzA0MA%3D%3D&el=1_x_2&_esc=publicationCoverPdf)