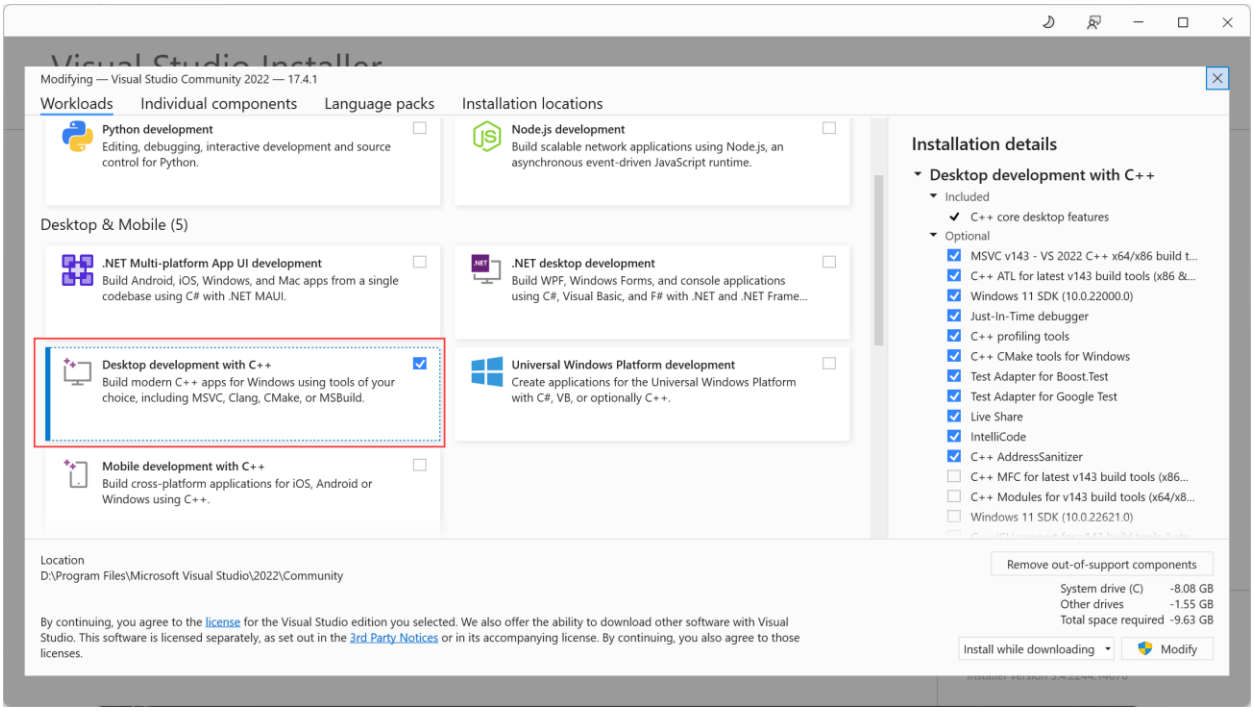
Install AutoProof on Windows

1. Installation of Visual Studio IDE



The installer can be downloaded via: https://visualstudio.microsoft.com/vs/

The version in this user guide is Visual Studio Community 2022

The necessary component includes features for C++ development: choose Desktop development with C++.

2. Install dotnet runtime

The version of dotnet runtime environment is NET Runtime 6.0.15, which can be downloaded via: https://dotnet.microsoft.com/en-us/download/dotnet/6.0

Once the installation finishes, you can find the files in C:\Program Files\dotnet
You might need to add this directory to the values of the environment variable **PATH**.

3. Install EiffelStudio IDE (standard version)

Download the installation package at https://account.eiffel.com/downloads

The version in this user guide is EiffelStudio 22.12, which is consistent with Visual Studio IDE 2022.

4. Download the installation files

1) Retrieve the files via: https://github.com/huangl223/ES-AP-Installation

2) Go to the EiffelStudio installation directory

    ..\Eiffel Software\EiffelStudio 22.12 Standard\studio\spec\win64\bin

   and replace the ec.exe with the one in

    ..\ES-AP-Installation

3) Go to the folder

    ..\Eiffel Software\EiffelStudio 22.12 Standard\library

   and replace the files in the folder

    ..\ES-AP-Installation\library

4) Go to the folder

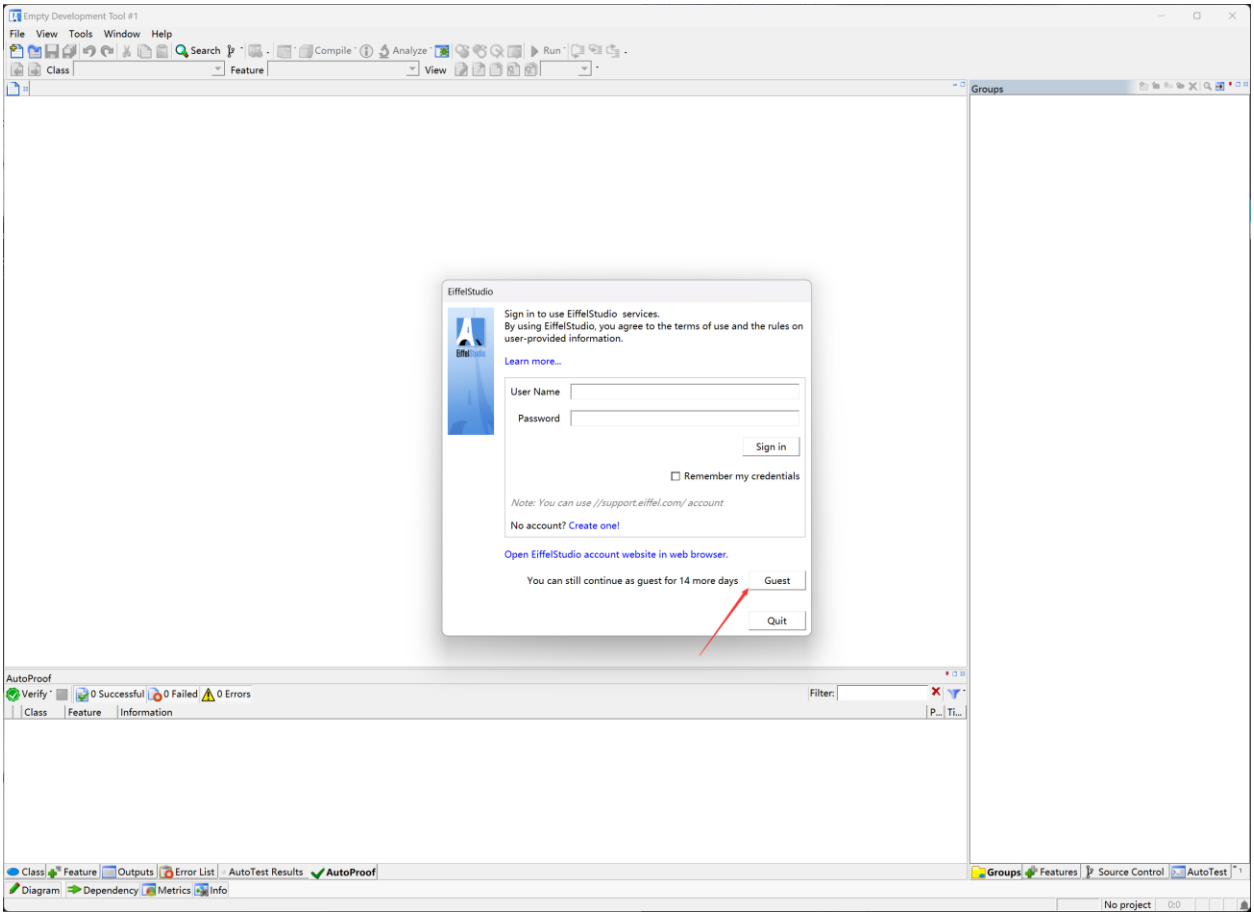
    ..\Eiffel Software\EiffelStudio 22.12 Standard\studio\tools

   and copy-paste two subfolders here

    ..\ES-AP-Installation\boogie

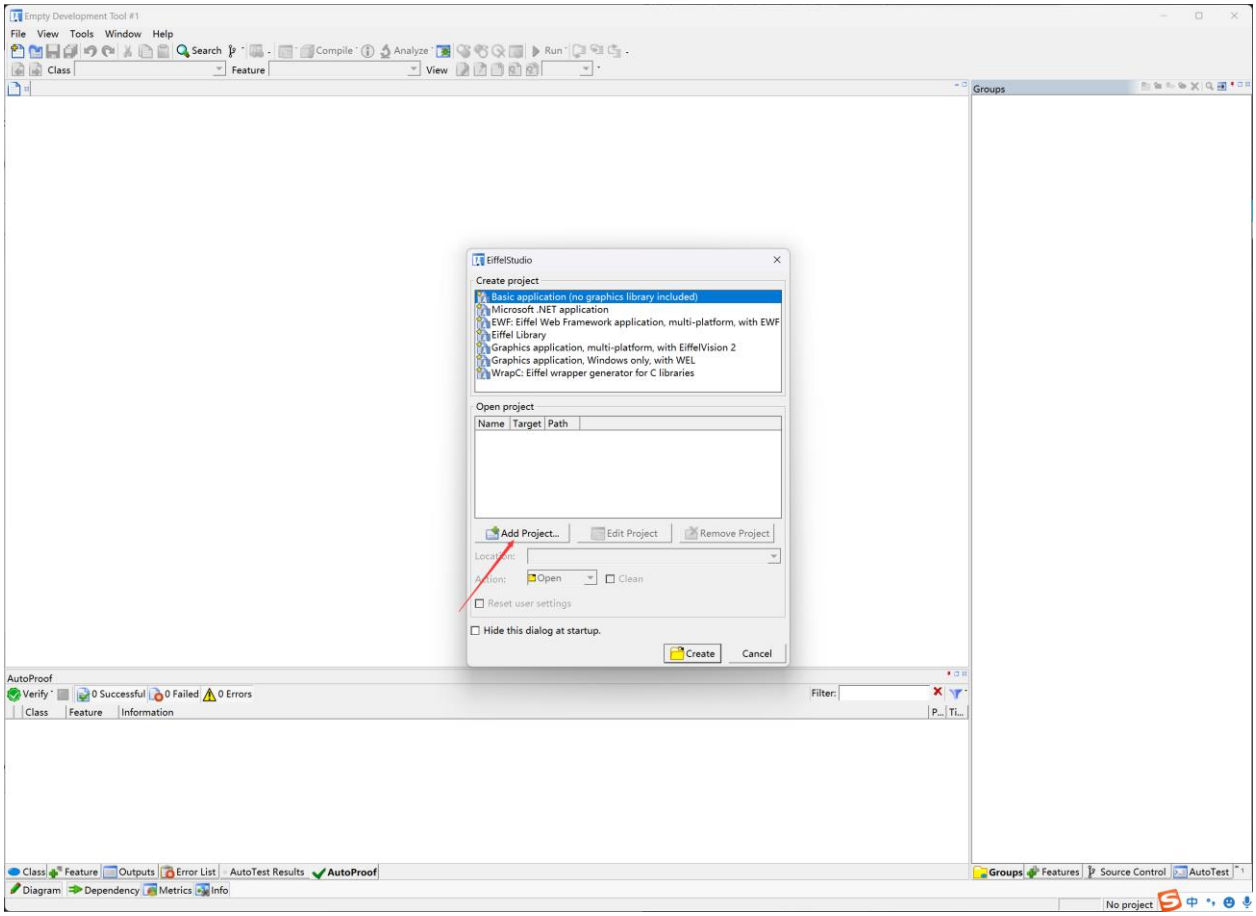
    ..\ES-AP-Installation\autoproof

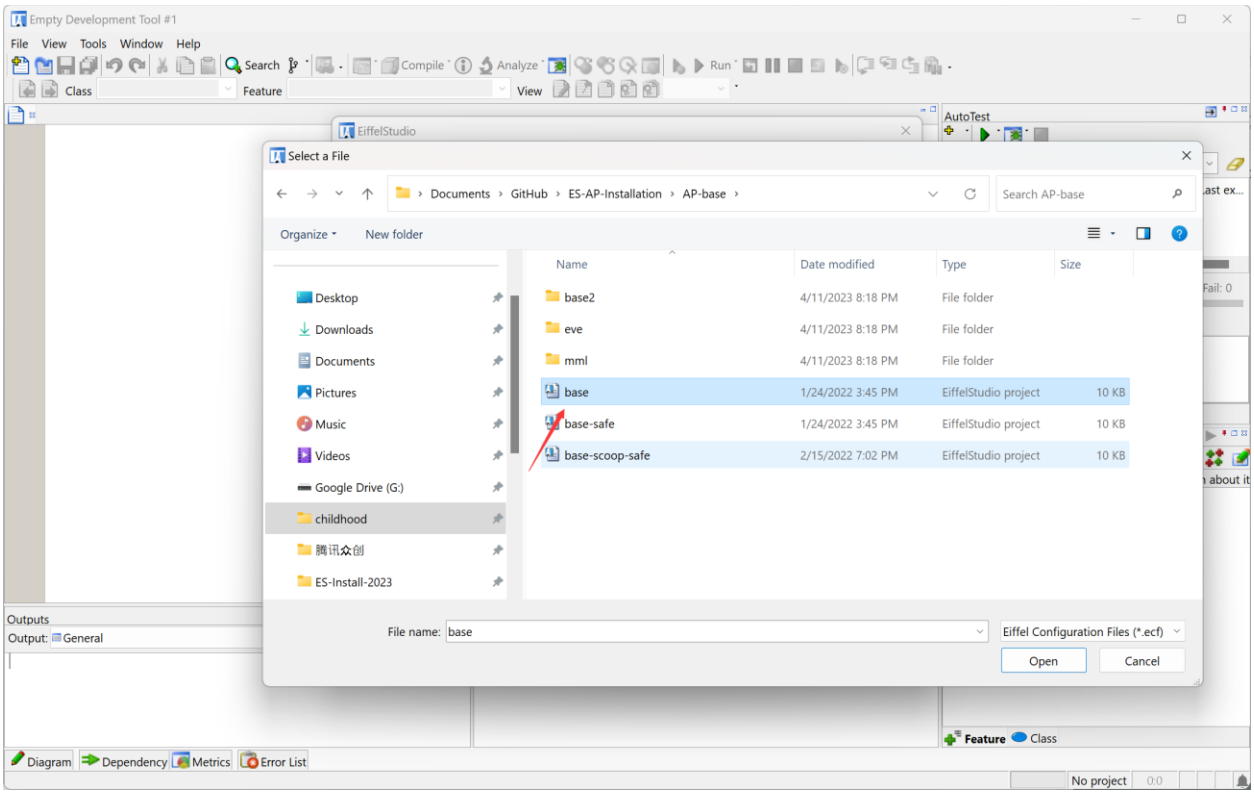
5) Launch EiffelStudio IDE, log in as Guest



Open and compile the following project:

.. \ES-AP-Installation\AP-base\base.ecf


Empty Development Tool #1
File View Tools Window Help
Search
Compile
Analyze
Run
Class
Feature
View
Groups
EiffelStudio
Create project
Basic application (no graphics library included)
Microsoft .NET application
EWF: Eiffel Web Framework application, multi-platform, with EWF
Eiffel Library
Graphics application, multi-platform, with EiffelVision 2
Graphics application, Windows only, with WEL
WrapC: Eiffel wrapper generator for C libraries
Open project
Name
Target
Path
Add Project...
Edit Project
Remove Project
Location:
Action:
Open
Clean
Reset user settings
Hide this dialog at startup.
Create
Cancel
AutoProof
Verify
0 Successful
0 Failed
0 Errors
Filter:
Class
Feature
Information
Class
Feature
Outputs
Error List
AutoTest Results
AutoProof
Diagram
Dependency
Metrics
Info
Groups
Features
Source Control
AutoTest
No project



5. Set up environment variables

1) Create an environment variable

   Name: AP

   Value: ..\ES-AP-Installation\AP-base

2) Add the directory of Z3 and Boogie to PATH:

   \ES-AP-Installation\z3-4.8.14-x64-win\bin

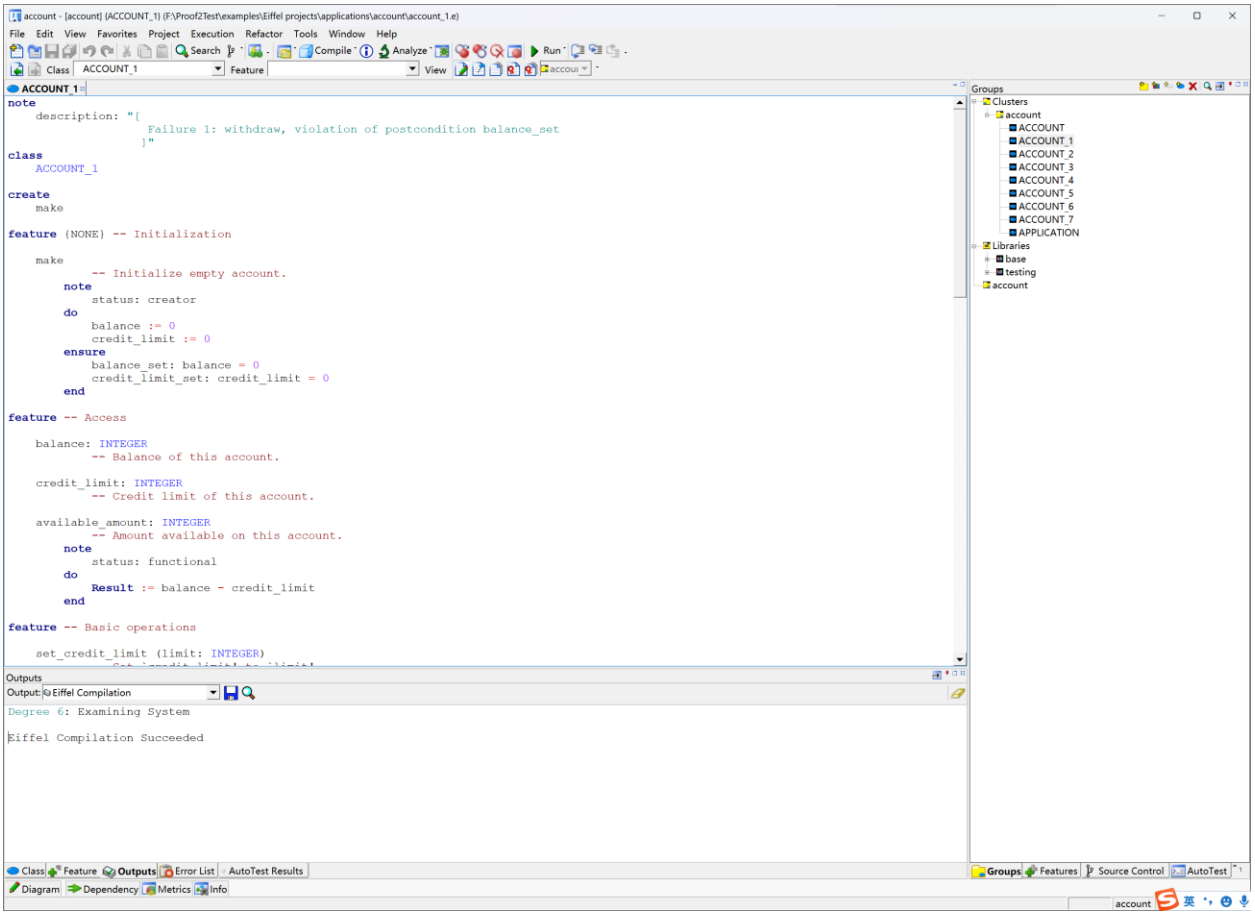
   \ES-AP-Installation\boogie

Example: Verify ACCOUNT_1 class in the account project

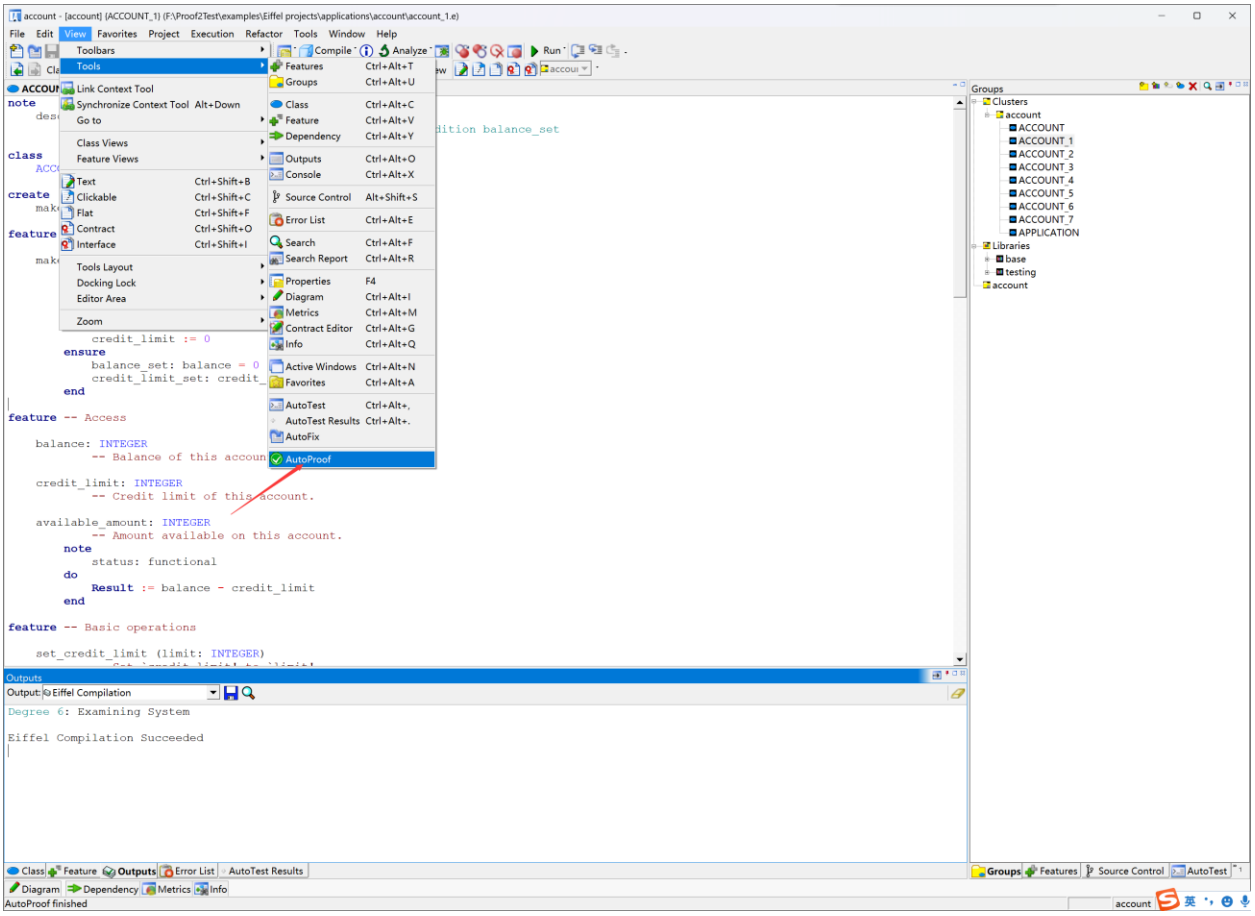
1. Launch EiffelStudio, log in as Guest.

2. Open and compile the project

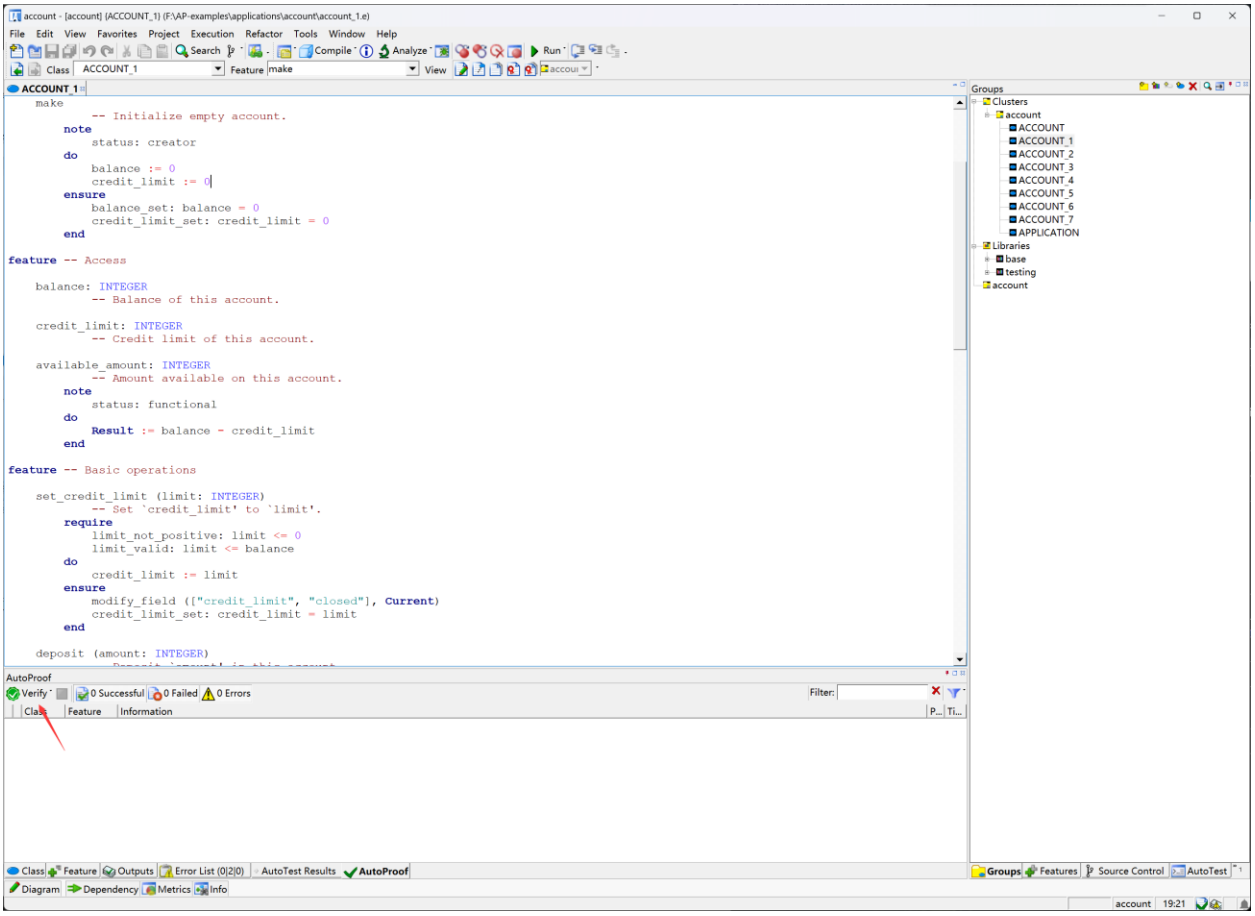
..\ES-AP-Installation\AP-examples\applications\account

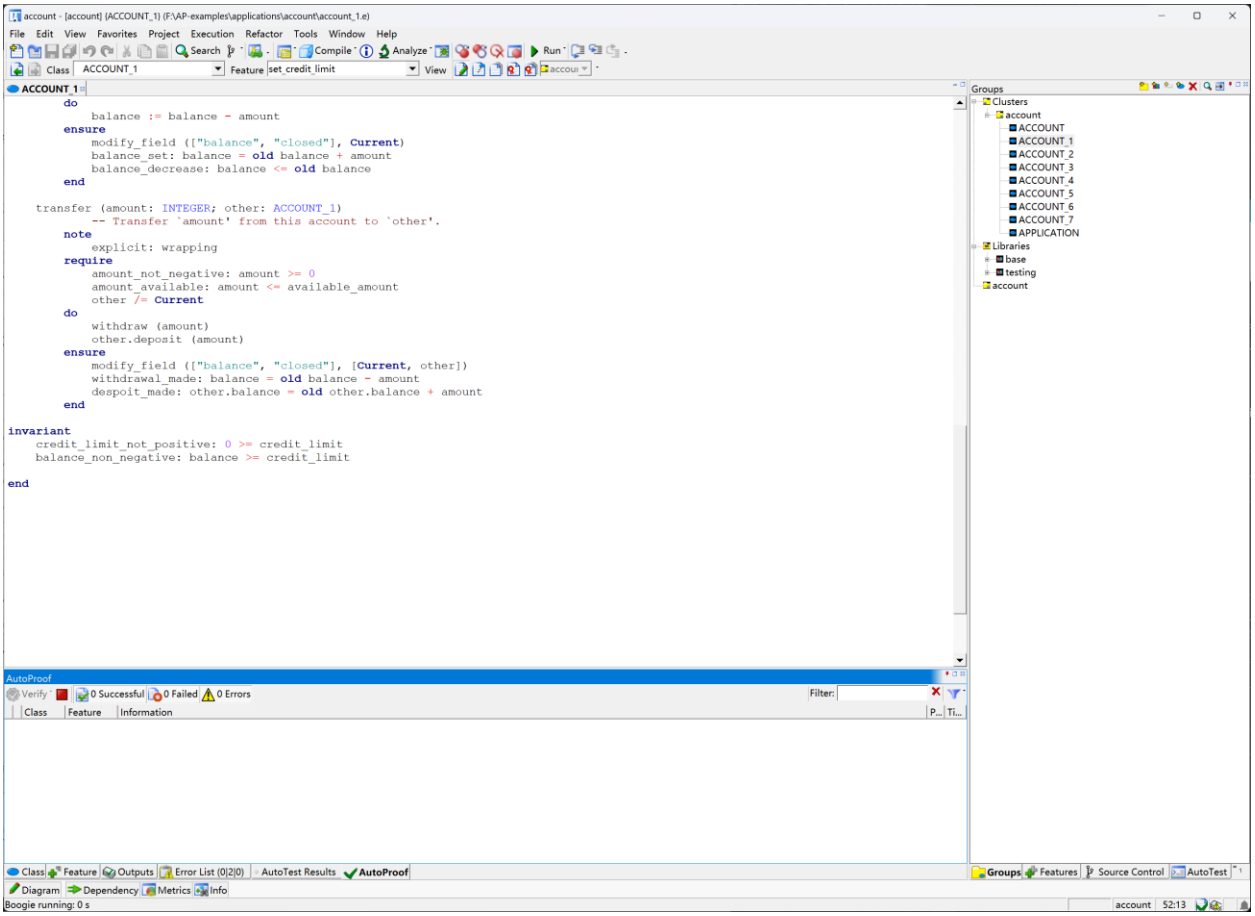


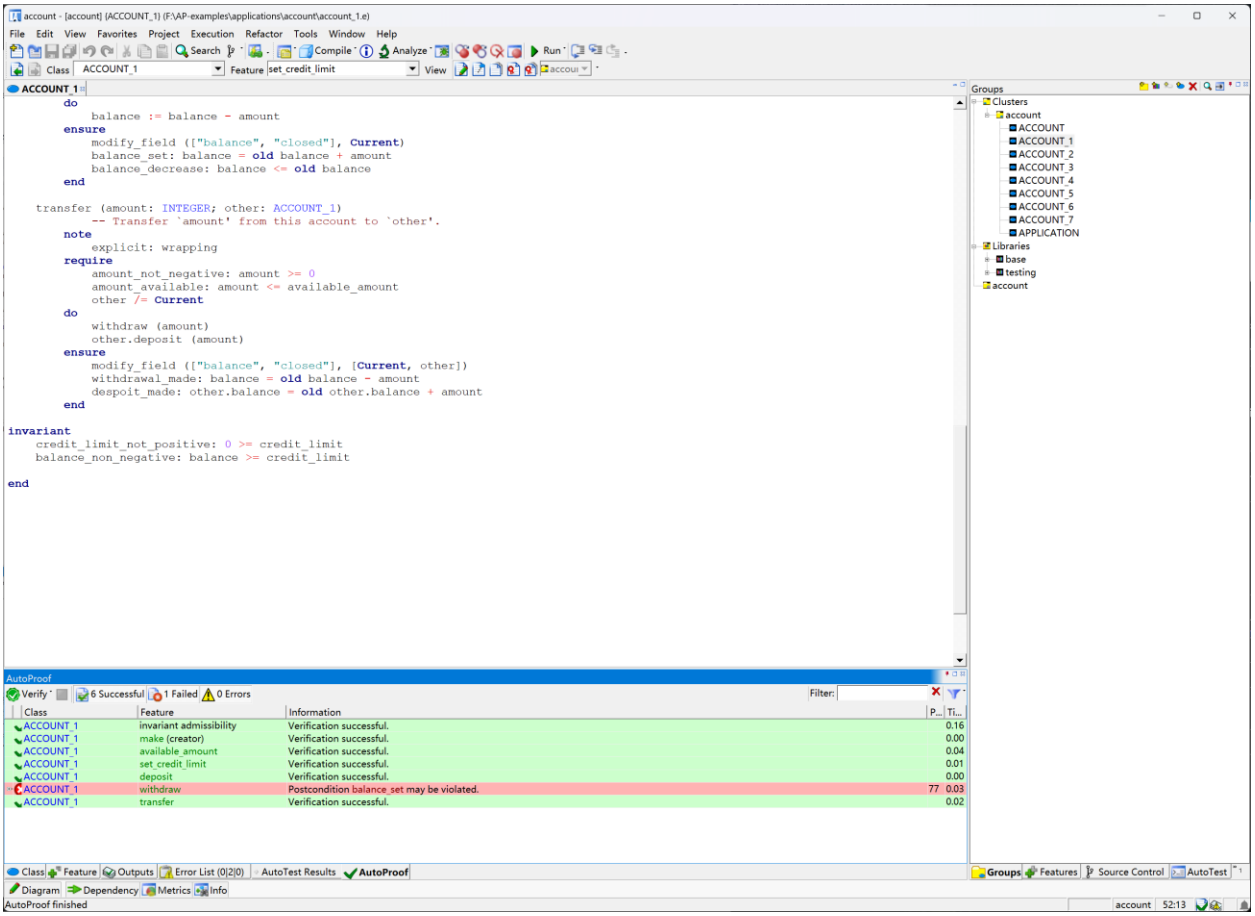
3. Launch AutoProof tool panel via: View | Tools | AutoProof



4. Select ACCOUNT_1 class in the Group panel (righthand side); click Verify button in the AutoProof panel to start the verification.




account - [account] {ACCOUNT_1} (F:\AP-examples\applications\account\account_1.e)
File Edit View Favorites Project Execution Refactor Tools Window Help
Search Compile Analyze Run
Class ACCOUNT_1 Feature set_credit_limit View
ACCOUNT_1
do
balance := balance - amount
ensure
modify_field (["balance", "closed"], Current)
balance_set: balance = old balance + amount
balance_decrease: balance <= old balance
end
transfer (amount: INTEGER; other: ACCOUNT_1)
-- Transfer `amount' from this account to `other'.
note
explicit: wrapping
require
amount_not_negative: amount >= 0
amount_available: amount <= available_amount
other /= Current
do
withdraw (amount)
other.deposit (amount)
ensure
modify_field (["balance", "closed"], [Current, other])
withdrawal_made: balance = old balance - amount
despoit_made: other.balance = old other.balance + amount
end
invariant
credit_limit_not_positive: 0 >= credit_limit
balance_non_negative: balance >= credit_limit
end
Groups
Clusters
account
ACCOUNT
ACCOUNT_1
ACCOUNT_2
ACCOUNT_3
ACCOUNT_4
ACCOUNT_5
ACCOUNT_6
ACCOUNT_7
APPLICATION
Libraries
base
testing
account
AutoProof
Verify 0 Successful 0 Failed 0 Errors
Filter:
Class Feature Information P... Ti...
Class Feature Outputs Error List (0|2|0) AutoTest Results AutoProof
Groups Features Source Control AutoTest
Diagram Dependency Metrics Info
Boogie running: 0 s
account 52:13


account - [account] (ACCOUNT_1) (F:\AP-examples\applications\account\account_1.e)
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despoit_made: other.balance = old other.balance + amount
end
invariant
credit_limit_not_positive: 0 >= credit_limit
balance_non_negative: balance >= credit_limit
end
Groups
Clusters
account
ACCOUNT
ACCOUNT_1
ACCOUNT_2
ACCOUNT_3
ACCOUNT_4
ACCOUNT_5
ACCOUNT_6
ACCOUNT_7
APPLICATION
Libraries
base
testing
account
AutoProof
Verify
6 Successful
1 Failed
0 Errors
Filter:
Class Feature Information P... Ti...
ACCOUNT_1 invariant admissibility Verification successful. 0.16
ACCOUNT_1 make (creator) Verification successful. 0.00
ACCOUNT_1 available_amount Verification successful. 0.04
ACCOUNT_1 set_credit_limit Verification successful. 0.01
ACCOUNT_1 deposit Verification successful. 0.00
ACCOUNT_1 withdraw Postcondition balance_set may be violated. 77 0.03
ACCOUNT_1 transfer Verification successful. 0.02
Class Feature Outputs Error List (0|2|0) AutoTest Results AutoProof
Diagram Dependency Metrics Info
Groups Features Source Control AutoTest
AutoProof finished
account 52:13

Possible problems and solutions:

1. Missing header files (.h), for example, windows.h, limits.h
   Solution:
   1) make sure that you have Windows 10 SDK installed;
   2) Add the location of the files to the values of the environment variable INCLUDE.

   Usually it includes the following values (Visual Studio 2019):

   ..Microsoft Visual Studio\2019\Community\SDK\ScopeCppSDK\vc15\SDK\include\um

   ..\Microsoft Visual Studio\2019\Community\SDK\ScopeCppSDK\vc15\SDK\include\ucrt

   ..\Microsoft Visual Studio\2019\Community\SDK\ScopeCppSDK\vc15\SDK\include\shared

   ..\Microsoft Visual Studio\2019\Community\SDK\ScopeCppSDK\vc15\SDK\include

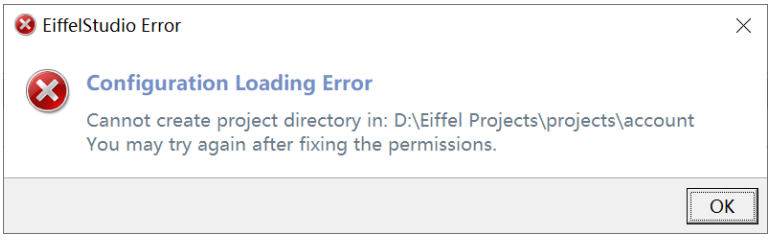
   ..\Microsoft Visual Studio\2019\Community\SDK\ScopeCppSDK\vc15\SDK\lib

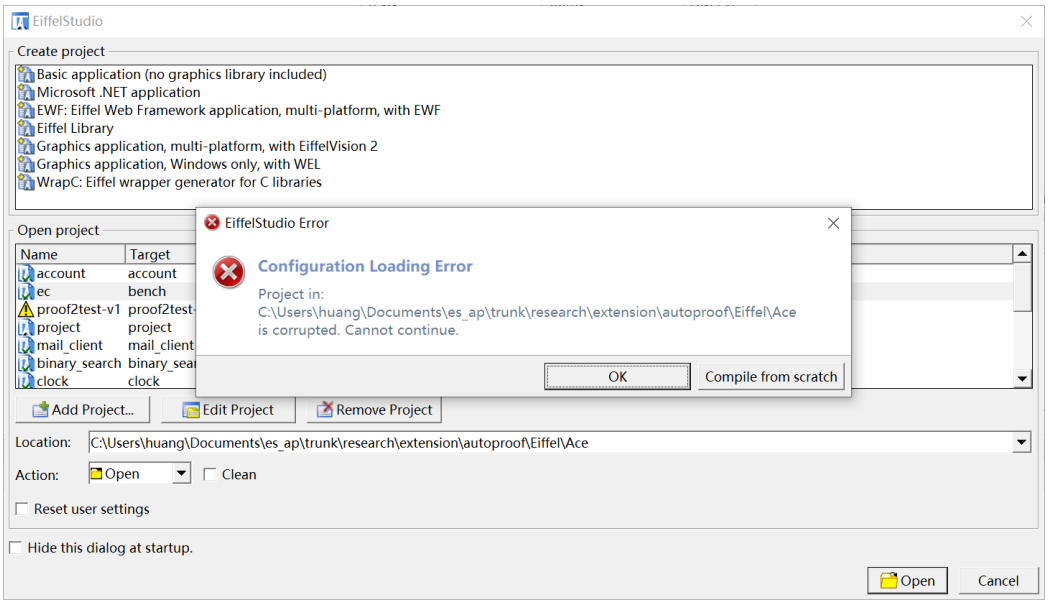
   (If you don't have the ScopeCppSDK package, you need to install "Azure Data Lake and Stream Analytics Tools" component in VS Installer.)

2. Missing library files (.lib file)
   Solution: Add the location of the files to the environment variable INCLUDE.
   Usually it includes the following values (Visual Studio 2019):
   ..\Microsoft Visual Studio\2019\Community\SDK\ScopeCppSDK\vc15\SDK\lib
   ..\Microsoft Visual Studio\2019\Community\VC\Tools\MSVC\14.28.29333\lib\x64

3. Unknown identifier "rc"
   Solution: add the location of the rc.exe to environment variable PATH
   An example location:
   .. Microsoft Visual Studio\2019\Community\SDK\ScopeCppSDK\vc15\SDK\bin

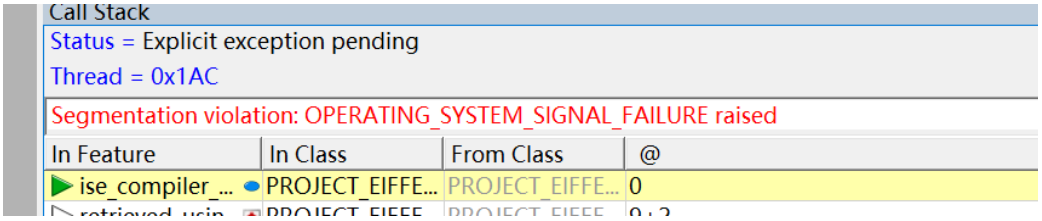
4. Configuration loading error occurs when loading a project





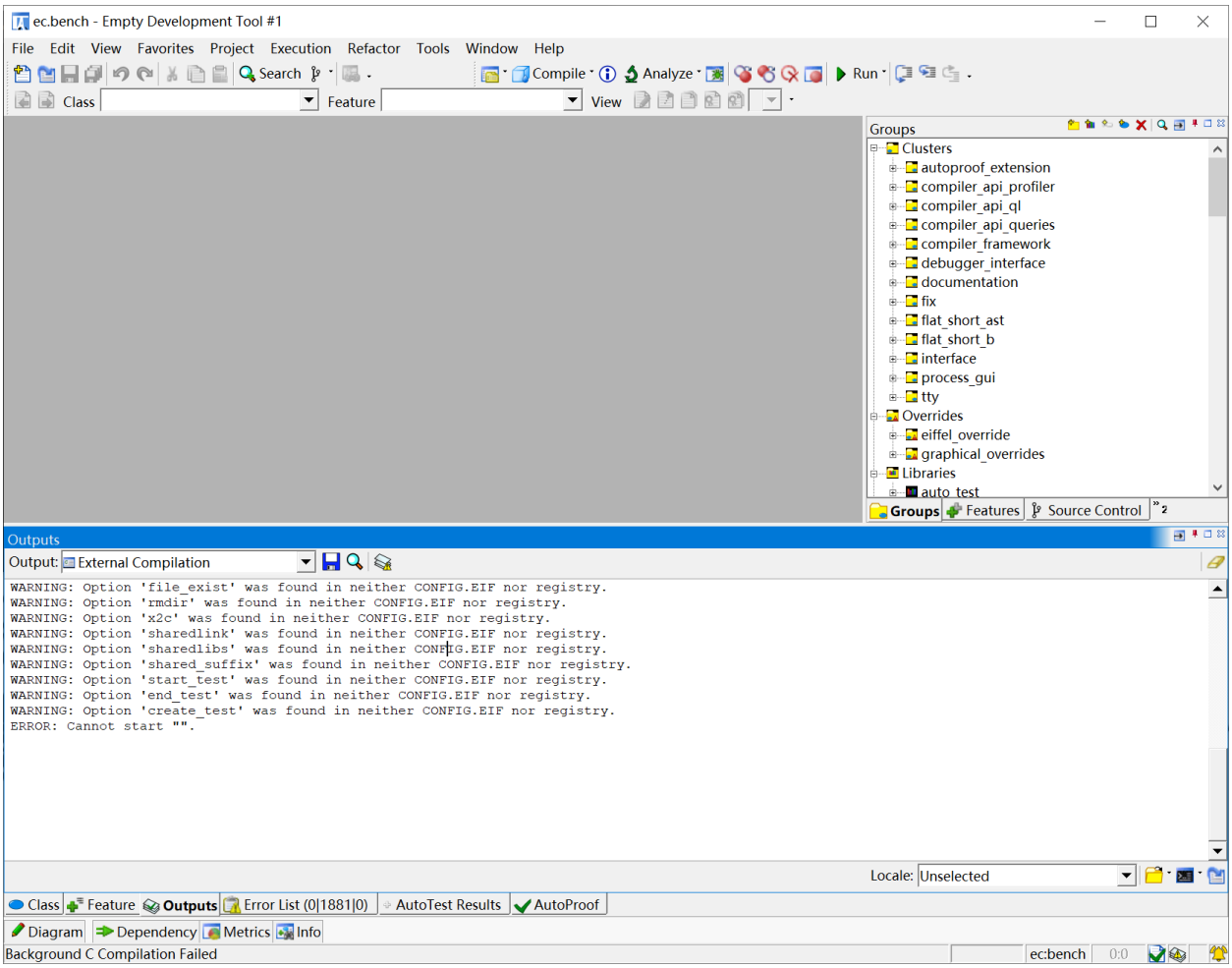
Solution: remove EIFGEN folder of the project and recompile

5. Segmentation violation



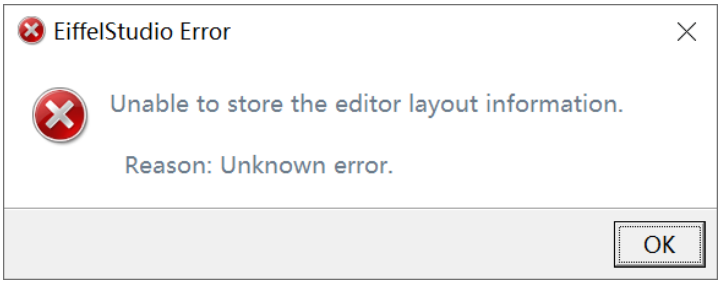
Solution: remove EIFGEN folder of the project and recompile

6. C compilation cannot start normally

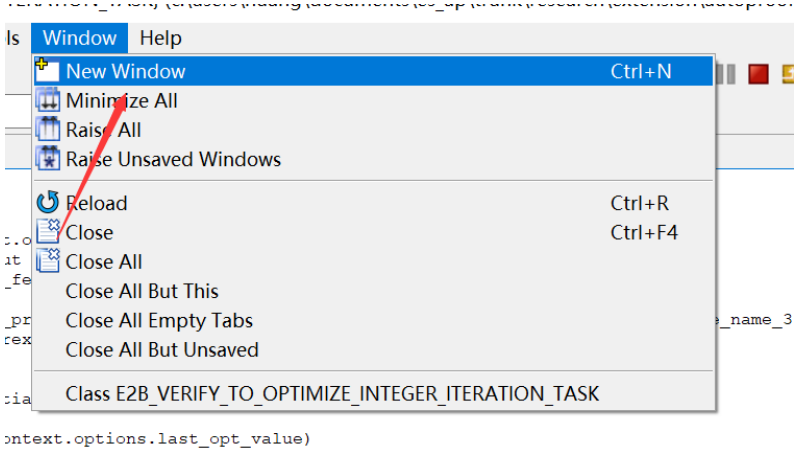


Solution: the C compiler cannot be accessed correctly. Make sure that the environment variable related to C compiler configuration is set correctly, for example, **ISE_C_COMPILER, PATH**

7. Layout setting error



Solution: Go to Window -> New Window, and close the initial window


ls
Window
Help
New Window Ctrl+N
Minimize All
Raise All
Raise Unsaved Windows
Reload Ctrl+R
Close Ctrl+F4
Close All
Close All But This
Close All Empty Tabs
Close All But Unsaved
Class E2B_VERIFY_TO_OPTIMIZE_INTEGER_ITERATION_TASK
ontext.options.last_opt_value)