



acontis technologies GmbH

SOFTWARE

EC-Master

Rust Programming Interface

Version 3.2

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1 Introduction

The Rust Wrapper provides a Rust interface to use EC-Master, EC-Simulator and RAS Client/Server.

1.1 Requirements

Rust v1.90.0 and above

- Download “rustup” and install Rust

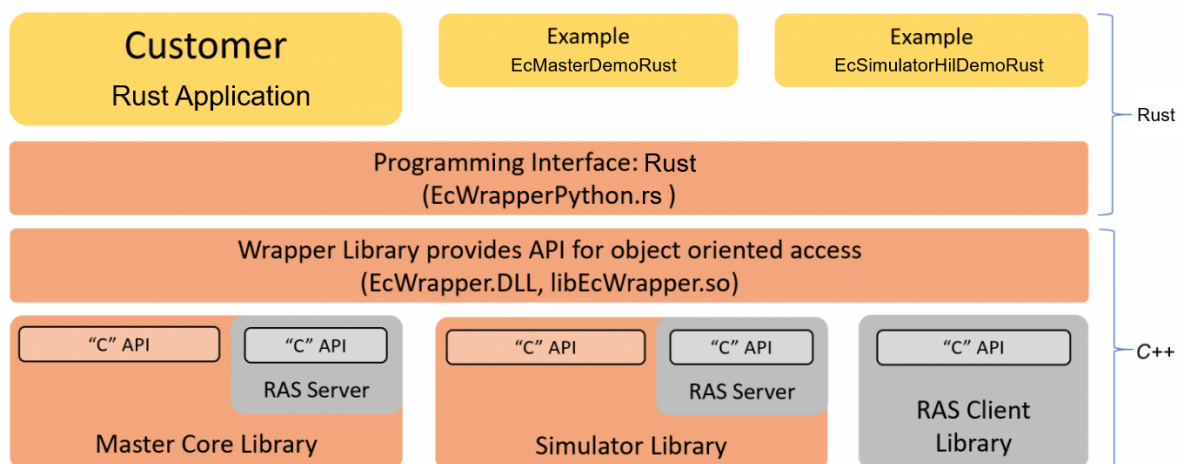
Windows (x86/x64)

- Microsoft Windows 10 and above
- Microsoft Visual C++ 2015 Runtime

Linux (x86/x64/ARM)

- Ubuntu 18.04 and above

1.2 Architecture



The architecture contains 4 basic layers:

Customer Rust application or our examples (EcMasterDemoRust, ...)

- Demo application, written in Rust

Programming Interface (EcWrapperRust)

- Provides an object oriented API written in Rust

Wrapper Library (EcWrapper)

- Native wrapper library, which provides API for object oriented access

Native Libraries

- Master Core Library
- Simulator Library
- RAS Client Library

2 Programmers Guide

2.1 Sample Application

There is currently 1 script available:

EcMasterDemoRust.bat

Starts the console demo application

2.2 Sample Code

The Rust demo application contains of 3 modules:

EcDemoApp.rs:

Console demo application

EcLogging.rs:

Logging module, which writes asynchronous messages to console, file, ...

EcUtil.rs:

Utility module, which contains some helper functions

2.3 Wrapper

2.3.1 Modules

The Rust Wrapper contains of 5 modules:

EcWrapperRust.rs

class CEcWrapperRust

EC-Wrapper base class

class CEcMasterRust

EC-Master

class CEcMasterMbxGatewayClientRust

Mailbox Gateway Client for EC-Master

class CEcMasterMbxGatewayServerRust

Mailbox Gateway Server for EC-Master

class CEcSimulatorRust

EC-Simulator

class CEcSimulatorRasServerRust

RAS Server for EC-Simulator

class CEcRasClientRust

RAS Client for EC-Master / EC-Simulator

EcMotionRust.rs

class CEcMotionRust

EC-Motion interface

EcWrapperRustTypes.rs

Rust types

EcWrapper.rs

C Rust interface (internal)

EcWrapperTypes.rs

C Rust types (internal)

2.3.2 Return code vs. exception handling

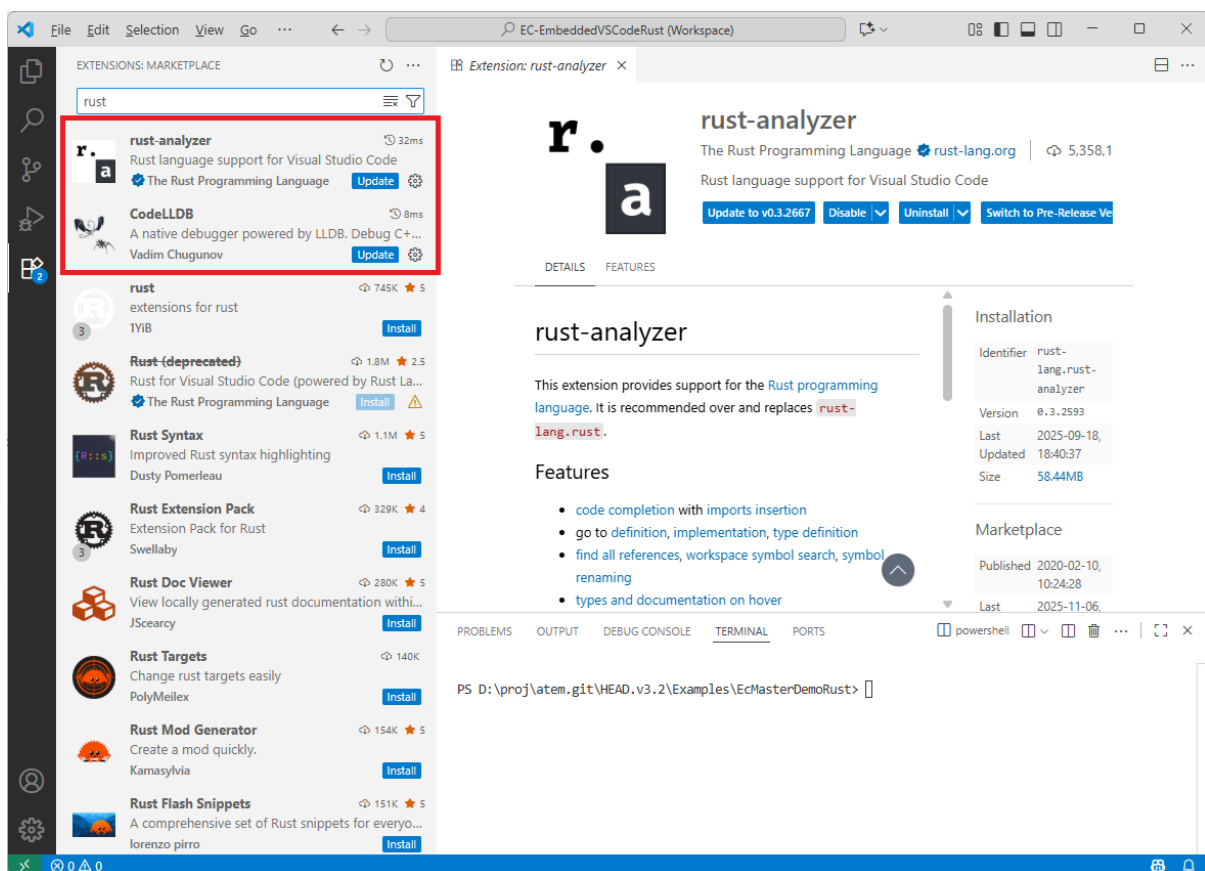
The most of all API functions returns a return code for error handling. This behaviour can be changed to throw an exception in error case by simply setting:

```
CEcWrapperRust_EnableExceptionHandling = true // default is false
```

2.4 Supported IDEs

2.4.1 Visual Studio Code

Install rust extension by open extension tab and enter *rust*:

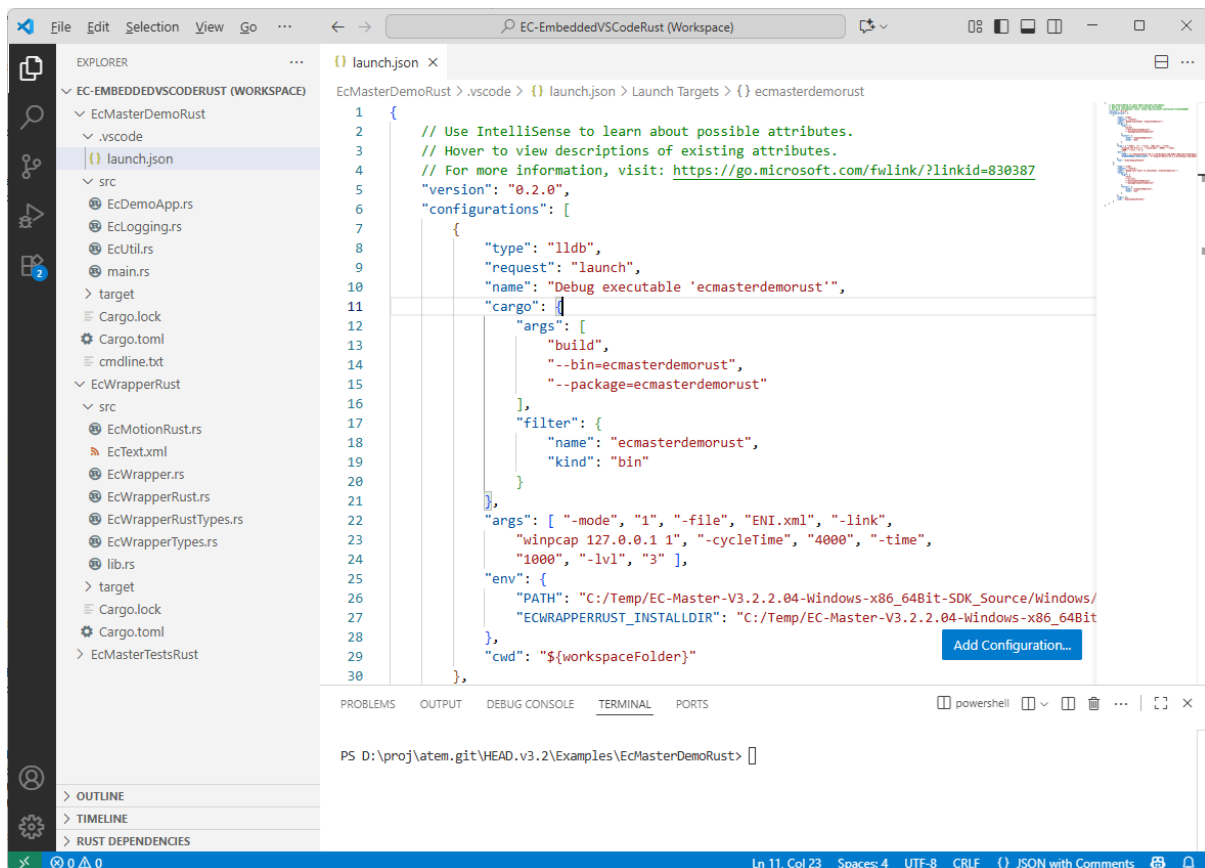


Open package folder e.g. **EC-Master-V3.2.2.04-Windows-x86_64Bit-SDK_Source** and configure the **launch.json**:

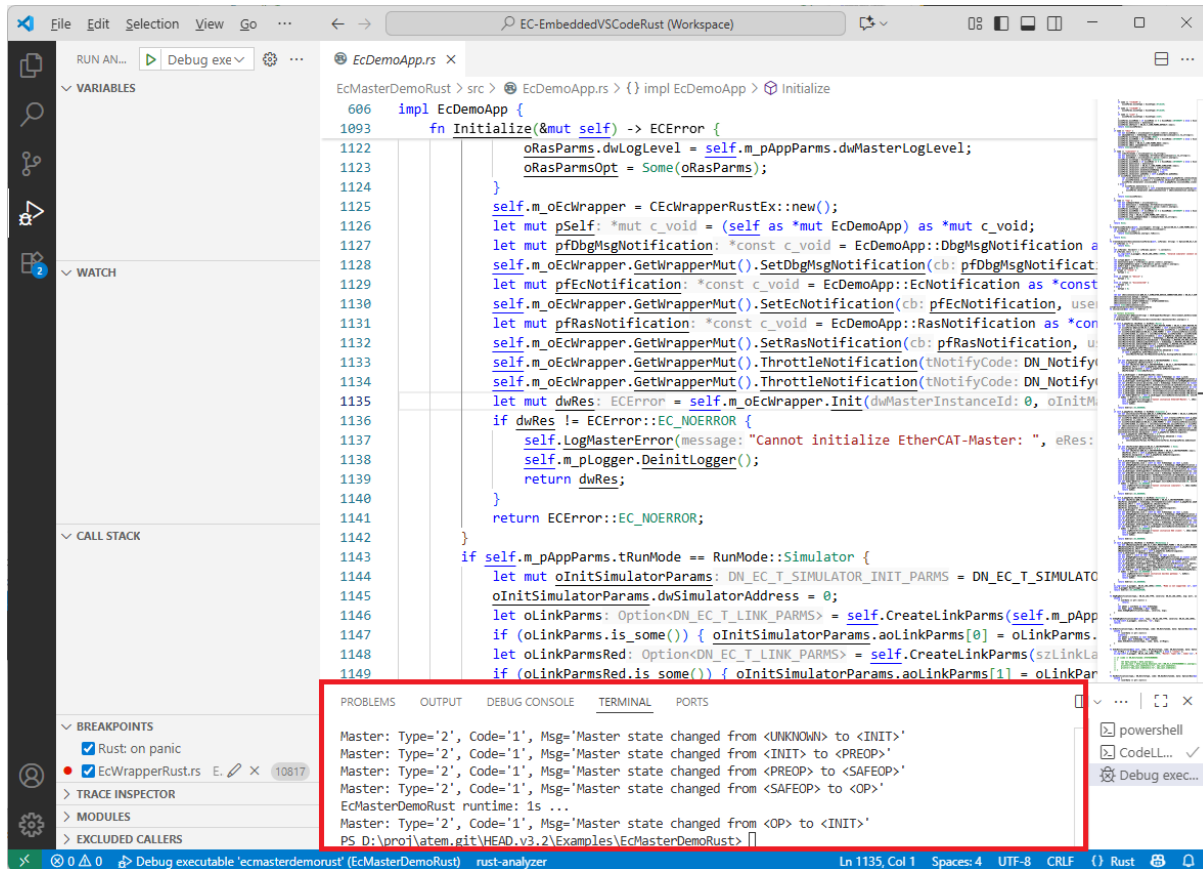
```

{
  "version": "0.2.0",
  "configurations": [
    {
      "type": "lldb",
      "request": "launch",
      "name": "Debug executable 'ecmasterdemorust'",
      "cargo": {
        "args": [
          "build",
          "--bin=ecmasterdemorust",
          "--package=ecmasterdemorust"
        ],
        "filter": {
          "name": "ecmasterdemorust",
          "kind": "bin"
        }
      },
      "args": [ "-mode", "1", "-file", "ENI.xml", "-link", "winpcap 127.0.0.1 1", "-cycleTime", "4000", "-time", "1000", "-lvl", "3" ],
      "env": {
        "PATH": "C:/Temp/EC-Master-V3.2.2.04-Windows-x86_64Bit-SDK_Source/Windows/x64/",
        "ECWRAPPERRUST_INSTALLDIR": "C:/Temp/EC-Master-V3.2.2.04-Windows-x86_64Bit-SDK_Source/Windows/x64/"
      },
      "cwd": "${workspaceFolder}"
    }
  ]
}

```



Start debugging and the demo output will be written into the terminal:



The screenshot shows the VS Code editor with the Rust source file `EcDemoApp.rs` open. The code is in the `Initialize` function, which sets up the application state and initializes the simulator. The terminal at the bottom shows the output of the program, which is the state changes of the Master component.

```

606 impl EcDemoApp {
1093     fn Initialize(&mut self) -> ECErr {
1122         oRasParams.dwLogLevel = self.m_pAppParams.dwMasterLogLevel;
1123         oRasParamsOpt = Some(oRasParams);
1124     }
1125     self.m_oEcWrapper = EcWrapperRustEx::new();
1126     let mut pSelf: *mut c_void = (self as *mut EcDemoApp) as *mut c_void;
1127     let mut pDbgMsgNotification: *const c_void = EcDemoApp::DbgMsgNotification as *const c_void;
1128     self.m_oEcWrapper.GetWrapperMut().SetDbgMsgNotification(cb: pDbgMsgNotification, u: 0);
1129     let mut pEcNotification: *const c_void = EcDemoApp::EcNotification as *const c_void;
1130     self.m_oEcWrapper.GetWrapperMut().SetEcNotification(cb: pEcNotification, u: 0);
1131     let mut pRasNotification: *const c_void = EcDemoApp::RasNotification as *const c_void;
1132     self.m_oEcWrapper.GetWrapperMut().SetRasNotification(cb: pRasNotification, u: 0);
1133     self.m_oEcWrapper.GetWrapperMut().ThrottleNotification(tNotifyCode: DN_NotifyCode::DN_Throttle, tNotifyCode: DN_Throttle);
1134     self.m_oEcWrapper.GetWrapperMut().ThrottleNotification(tNotifyCode: DN_Throttle, tNotifyCode: DN_Throttle);
1135     let mut dwRes: ECErr = self.m_oEcWrapper.Init(dwMasterInstanceId: 0, oInitParams: oInitParams);
1136     if dwRes != ECErr::NOERROR {
1137         self.LogMasterError(message: "Cannot initialize EtherCAT-Master: ", eRes: dwRes);
1138         self.m_pLogger.DeinitLogger();
1139         return dwRes;
1140     }
1141     return ECErr::NOERROR;
1142 }
1143 if self.m_pAppParams.tRunMode == RunMode::Simulator {
1144     let mut oInitSimulatorParams: DN_EC_T_SIMULATOR_INIT_PARMS = DN_EC_T_SIMULATOR_INIT_PARMS;
1145     oInitSimulatorParams.dwSimulatorAddress = 0;
1146     let oLinkParams: Option<DN_EC_T_LINK_PARMS> = self.CreateLinkParams(self.m_pAppParams.oLinkParams);
1147     if (oLinkParams.is_some()) { oInitSimulatorParams.aoLinkParams[0] = oLinkParams; }
1148     let oLinkParamsRed: Option<DN_EC_T_LINK_PARMS> = self.CreateLinkParams(self.m_pAppParams.oLinkParamsRed);
1149     if (oLinkParamsRed.is_some()) { oInitSimulatorParams.aoLinkParams[1] = oLinkParamsRed; }
1150 }

```

The terminal output shows the following messages:

```

Master: Type='2', Code='1', Msg='Master state changed from <UNKNOWN> to <INIT>'
Master: Type='2', Code='1', Msg='Master state changed from <INIT> to <PREOP>'
Master: Type='2', Code='1', Msg='Master state changed from <PREOP> to <SAFEOP>'
Master: Type='2', Code='1', Msg='Master state changed from <SAFEOP> to <OP>'
EcMasterDemoRust runtime: 1s ...
Master: Type='2', Code='1', Msg='Master state changed from <OP> to <INIT>'
PS D:\proj\atem.git\HEAD.v3.2\examples\EcMasterDemoRust>

```

3 FAQ

I installed Rust and the demo crashes with strange errors. What can I do?

This might be a problem of mixing x86 with x64 binaries. Verify that if you have installed the Rust runtime for x64 bit, please install also EC-Master for x64 bit.