# Development Configuration

## For the XCAM RIXSCam EPICS support system

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## Introduction

This document sets out the steps necessary to establish a working development environment for the EPICS IOC software supporting the RIXSCam camera. These instructions are suitable for the configuration used to develop the software:

* 64-bit Windows (7, 8 or 10 should be fine)
* Visual Studio 2013 (Professional or Community)
* The IOC is based on EPICS base version R3.14.12.5, with the patches from <http://www.aps.anl.gov/epics/base/R3-14/12-docs/KnownProblems.html> applied.
* Using the Win64-dynamic configuration
* Using SynApps version 5\_8, updated according to the instructions contained in <http://www.aps.anl.gov/epics/tech-talk/2015/msg01541.php>.
* Using areaDetector version 2\_4, with sub-projects:
  + ADCore 2\_4
  + ADBinaries 2\_2

Whilst the software itself should not be unduly version-sensitive, experience has shown that there are numerous and frequent issues of incompatibility between different versions of the EPICS components, particularly on Windows.

## Tool installations

Download and/or install the following tools:

* Visual Studio 2013 (Professional or Community), including the C++ and C# compilers. (The C# compiler is required to use the PVGenerator system; it is not required if you are not changing the PVs)
* Strawberry Perl (<http://strawberryperl.com/>). This is said to include the MinGW toolset, but if not you may have also to download:
  + MinGW (<http://www.mingw.org/wiki/Getting_Started>)
* EPICS tools for Windows (<http://aps.anl.gov/epics/distributions/win32/index.php>; most recent 64-bit version)
* CS-Studio version 4.20 (<https://sourceforge.net/projects/cs-studio/files/nsls2-release/>). This download includes the proper BOY version).
* If you need to build the IOC installer, you will need Inno (<http://www.jrsoftware.org/isdl.php>)

## Establishing an EPICS software set

There are two approaches to this:

* From scratch: download the sources, apply all the necessary patches, set the configuration files appropriately, and build the binaries from the sources.
* From a directory dump prepared by someone who has already done the above.

This document attempts to describe both approaches but the situation is fluid (as more patches are discovered and the documentation/code is correspondingly modified), and establishing a software set from scratch is unlikely to be pain-free.

First, create a top directory which I will refer to as MyEPICS[[1]](#footnote-1).

### From Scratch

(Skip down to ‘From directory dump’ if you’re taking that approach)

#### Source installations

You will need to download several sets of source files as follows:

* EPICS base version R3.14.12.5 (from <http://aps.anl.gov/epics/download/base/index.php>) . Unpack this file to MyEPICS\base, so you should end up with a directory MyEPICS\base\bin.
* SynApps version 5\_8 (from <https://www1.aps.anl.gov/BCDA/synApps/Where-to-find-it>). Unpack this to MyEPICS\synApps, so you should end up with a directory MyEPICS\synApps\synApps\_5\_8\support\areaDetector-R2-0.  
  **Delete** this specific directory and all its contents (because we’re going to replace it by a later version, below).
* areaDetector version 2\_4, formed from the following sub-projects:
  + ADCore 2\_4 (<https://github.com/areaDetector/ADCore>; look for version 2\_4 under the Releases list and download the Zip file). Unpack this to MyEPICS\synApps\synApps\_5\_8\support\areaDetector-R2-4\ADCore; you should end up with a directory   
    MyEPICS\synApps\synApps\_5\_8\support\areaDetector-R2-4\ADCore\ADApp
  + ADBinaries 2\_2 (<https://github.com/areaDetector/ADBinaries>; look for the specific version). Unpack this to   
    MyEPICS\synApps\synApps\_5\_8\support\areaDetector-R2-4\ADBinaries; you should end up with a directory  
    MyEPICS\synApps\synApps\_5\_8\support\areaDetector-R2-4\ADBinaries\configure

#### Patches

Unfortunately it’s necessary to patch some of the above to fix known issues.

##### EPICS base

Follow the instructions on the following page: <http://www.aps.anl.gov/epics/base/R3-14/12-docs/KnownProblems.html> . Not every patch is strictly necessary, but I recommend that you apply any patch that might be significant. In particular, the following issues should be patched:

* epicsThread issue
* dbContextReadNotifyCacheAllocator issue
* VS2015 issues (only if you are using that compiler)

##### SynApps

Follow the instructions from: <http://www.aps.anl.gov/epics/tech-talk/2015/msg01541.php>

#### Msi tool

You may need this tool to build areaDetector: <http://www.aps.anl.gov/epics/extensions/msi/index.php> - although it seems that I did not need it. You can download a pre-built version from here: <http://www.aps.anl.gov/epics/download/distributions/index.php>

#### Configure

You need to set up configuration files according to the specific locations of your installation, and also the tools (compiler, etc.) that you have used.

Create a file in MyEPICS\base\startup called Win64-dynamic.bat (or edit it if there’s one there already) with the following contents, adjusted to match the installation locations you’ve chosen (these are marked in red)

REM ----- WINXP, Vista, Windows 7 -----

set PATH=C:\WINDOWS\system32;C:\WINDOWS;C:\WINDOWS\SYSTEM32\Wbem

REM --------------- Strawberry perl -------------------

set PATH=D:\Development\Tools\Strawberry\perl\bin;%PATH%

REM --------------- mingw make ------------------------

set PATH=D:\Development\Tools\MinGW\bin;%PATH%

REM ----- Visual Studion 2013 -----

REM -- windows-x64 ---

call "C:\Program files (x86)\Microsoft Visual Studio 12.0\VC\vcvarsall.bat" x64

REM ======================================================

REM --------------- EPICS --------------------------------

REM ======================================================

set EPICS\_HOST\_ARCH=windows-x64

set PATH=%PATH%;<MyEPICS>\base\bin\%EPICS\_HOST\_ARCH%

set PATH=%PATH%;<MyEPICS>\base\extensions\bin\%EPICS\_HOST\_ARCH%

REM ======================================================

REM ----------------- GNU make flags ---------------------

REM ======================================================

set MAKEFLAGS=-w

(Note: replace <MyEPICS> by the full path to your top directory)

#### Build

##### Core components

Open a command window.

Execute the batch file <MyEPICS>\base\startup\Win64-dynamic.

Change directory to <MyEPICS>\base, and enter the commands:

mingw32-make clean uninstall

mingw32-make

This should build the EPICS core components.

##### SynApps

Edit the file <MyEPICS>\configure\RELEASE as follows. **When specifying file paths (including MyEPICS), use only xnix-style forward slashes throughout**

* Set the SUPPORT symbol to <MyEPICS>/synApps/synApps\_5\_8/support
* Set the EPICS\_BASE symbol to <MyEPICS>/base

Also edit the files <MyEPICS>\configure\ EPICS\_BASE.windows-x64 and …SUPPORT.windows-x64 correspondingly.

Open a command window.

Change directory to <MyEPICS>\synApps\synApps\_5\_8\support, and enter the commands

mingw32-make release

mingw32-make

This should build the SynApps components.

##### AreaDetector

Follow the guide at <https://github.com/areaDetector/areaDetector/blob/master/INSTALL_GUIDE.md> as to how to configure the build using the RELEASE\_PATHS.local (etc.) files, ending with the ‘make’ command.

(Now skip to ‘Inject XCAM projects’, below)

### From Directory Dump

The objective here is to end up with a complete set of EPICS sources and pre-built binaries. This should be the result you would obtain by following the ‘From scratch’ procedure, but be much simpler and quicker.

Copy (or unpack) the directory dump into the <MyEPICS> directory. When this is complete you should find you have a directory <MyEPICS>\base and another <MyEPICS>\SynApps.

### Inject XCAM projects

(This task and those beyond it are common, whether you chose to build the EPICS ‘From Scratch’ or ‘From Directory Dump’.

You should now have a directory <MyEPICS>\synApps\synApps\_5\_8\support\areaDetector-R2-4.

Create a subdirectory of this …\ADxcam and another alongside it …\ADxcamProjects.

Either use Git to clone the XCAM repositories into these directories, or copy all the files from another machine.

You should now have a file called

<MyEPICS>\synApps\synApps\_5\_8\support\areaDetector-R2-4\ ADxcam\exampleApp\xcamCameraSrc\xcamCamera.cpp

* and another called

<MyEPICS>\synApps\synApps\_5\_8\support\areaDetector-R2-4\ ADxcamProjects\xcamCameraIOC\xcamCameraIOC.sln

You should be able to open the latter Solution file in Visual Studio. It should contain the following projects:

* PVGenerator (a utility program, written in C#, used to generate the large number of files that correspond to the database (PV) definitions contained within files named Parameters.csv. It is invoked as part of the build process of some of the other projects)
* xcamCamera, which compiles to xcamCamera.dll
* xcamCameraIOC, which compiles to the IOC executable xcamCameraIOC.exe
* xcamRIXSPlugin, which compiles to a static library that provides the RIXS plugin for the IOC.

You should now be able to compile the solution and run and/or debug the executable.

1. There are very many places in the system where full paths are specified. While not necessary, you fill find everything much easier if you choose a directory of the such as C:\Development\Clients\XCAM\EPICS – choosing a different drive letter would not have a big impact provided the remainder is as shown. [↑](#footnote-ref-1)