

## Resources

- TIDL Build and Run Instructions : [Click Here](#)
- Installation Manual : [Click Here](#)

## Setup Tutorial in Ubuntu

### To install SDK

- Click The link : [Here](#)
- And download "ti-processor-sdk-rtos-j721e-evm-09\_00\_01\_01-prebuilt.tar.gz" File
- To open Terminal : Ctrl + Alt + T

### To export the path

1. Open Terminal
2. open bashrc script with nano or vim

```
vi ~/.bashrc
```

1. Enter the following text

```
export TIDL_INSTALL_PATH=~/.PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-tidl
export TIDL_GRAPHVIZ_PATH=/usr
export PSDK_INSTALL_PATH=~/.PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01
export SOC=j721e
```

```
export TIDL_INSTALL_PATH=~/.PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-tidl
export TIDL_GRAPHVIZ_PATH=/usr
export PSDK_INSTALL_PATH=~/.PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01
export SOC=j721e
```

### To install dependencies

- All the dependencies should be installed inside ti-processor-sdk-rtos-j721e-evm-09\_00\_01\_01 directory
1. Graphviz tool

```
cd ${PSDK_INSTALL_PATH}
sudo apt install graphviz-dev
```

- We need to build this inside the TIDL\_INSTALL\_PATH directory

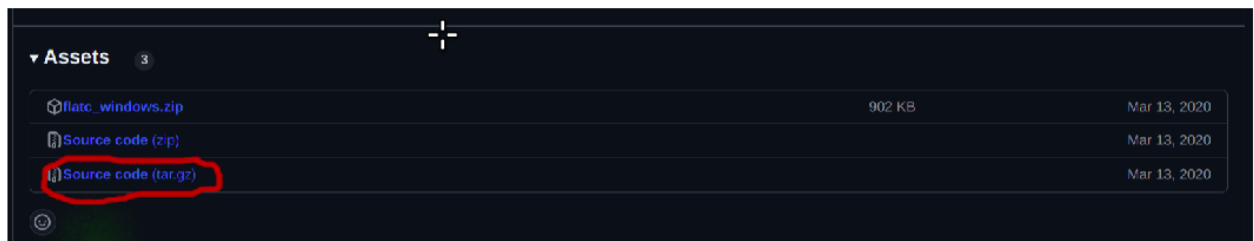
```
cd ${TIDL_INSTALL_PATH}
TARGET_PLATFORM=PC make gv
```

## 2. Google Protobuf

```
cd ${PSDK_INSTALL_PATH} # If you are in this directory then leave it
wget
https://github.com/protocolbuffers/protobuf/releases/download/v3.11.3/
protobuf-cpp-3.11.3.tar.gz
tar -xvzf protobuf-cpp-3.11.3.tar.gz
```

## 3. Google Flatbuffer

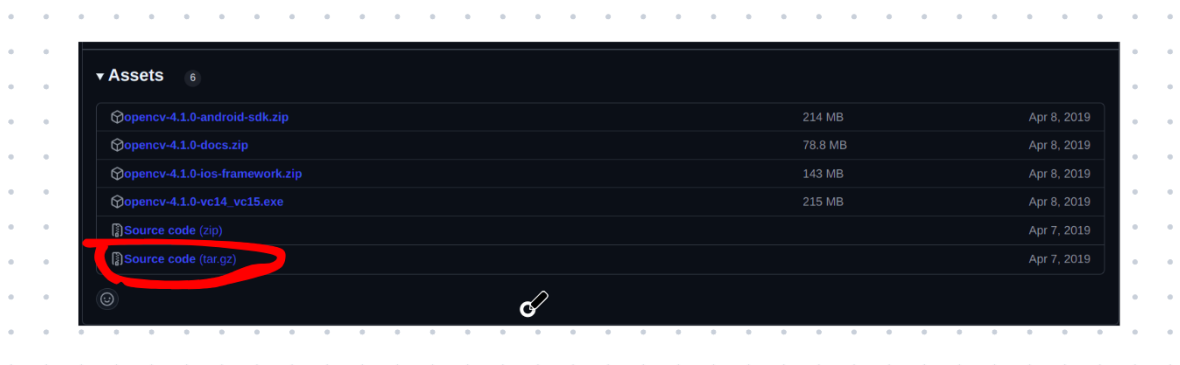
- Download tar file form this [link](#)



```
cd ${PSDK_INSTALL_PATH}
tar -xvzf flatbuffers-1.12.0.tar.gz
```

## 4. Open CV

- Download tar file form this [link](#)



```
cd ${PSDK_INSTALL_PATH}
tar -xvzf opencv-4.1.0.tar.gz
```

# Building the dependencies

## 1. OpenCV

```
cd ${PSDK_INSTALL_PATH}
cd opencv-4.1.0/cmake
cmake -DBUILD_opencv_highgui:BOOL="1" -DBUILD_opencv_videoio:BOOL="0"
-DWITH_IPP:BOOL="0" -DWITH_WEBP:BOOL="1" -DWITH_OPENEXR:BOOL="1" -
-DWITH_IPP_A:BOOL="0" -DBUILD_WITH_DYNAMIC_IPP:BOOL="0" -
-DBUILD_opencv_cudacodec:BOOL="0" -DBUILD_PNG:BOOL="1" -
-DBUILD_opencv_cudaobjdetect:BOOL="0" -DBUILD_ZLIB:BOOL="1" -
-DBUILD_TESTS:BOOL="0" -DWITH_CUDA:BOOL="0" -
-DBUILD_opencv_cudafeatures2d:BOOL="0" -
-DBUILD_opencv_cudaoptflow:BOOL="0" -DBUILD_opencv_cudawarping:BOOL="0"
-DINSTALL_TESTS:BOOL="0" -DBUILD_TIFF:BOOL="1" -DBUILD_JPEG:BOOL="1" -
-DBUILD_opencv_cudaarithm:BOOL="0" -DBUILD_PERF_TESTS:BOOL="0" -
-DBUILD_opencv_cudalegacy:BOOL="0" -DBUILD_opencv_cudaimgproc:BOOL="0"
-DBUILD_opencv_cudastereo:BOOL="0" -DBUILD_opencv_cudafilters:BOOL="0"
-DBUILD_opencv_cudabgsegm:BOOL="0" -DBUILD_SHARED_LIBS:BOOL="0" -
-DWITH_ITT=OFF ../
# Run the make file
make
```

## 2. Protobuf

```
cd ${PSDK_INSTALL_PATH}
cd protobuf-3.11.3/
./configure CXXFLAGS=-fPIC --enable-shared=no LDFLAGS="-static"
make
```

## 3. Flatbuffer

```
cd ${PSDK_INSTALL_PATH}
cd flatbuffers-1.12.0/
cmake -G "Unix Makefiles" -DCMAKE_BUILD_TYPE=Release -
-DCMAKE_CXX_FLAGS="-Wno-class-memaccess"
make
```

## 4. Tensorflow

```
cd ${PSDK_INSTALL_PATH}
git clone --depth 1 --single-branch -b tidl-j7
https://github.com/TexasInstruments/tensorflow.git
```

## 5. Onnxruntime

```
cd ${PSDK_INSTALL_PATH}
git clone --depth 1 --single-branch -b tidl-j7
https://github.com/TexasInstruments/onnxruntime.git
```

## 6. TVM

```
cd ${PSDK_INSTALL_PATH}
git clone --single-branch -b tidl-j7
https://github.com/TexasInstruments/tvm
cd tvm
git submodule init
git submodule update --init --recursive
```

## Build the TIDL PC Tools

- Before that just refer this file

```
ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-
tidl/makerules/config.mk
```

```
129 else
130 PSDK_TOOLS_PATH      ?= $(HOME)/ti
131 # Set the default gcc based on the version of Ubuntu
132 OS_VERSION := $(shell cat /etc/os-release | grep VERSION_ID= | sed -e "s|VERSION_ID=||" | sed -e "s|\"|\"|")
133 ifeq ($(OS_VERSION),18.04)
134     TIDL_GCC_VERSION?=5
135 else
136     TIDL_GCC_VERSION?=11
137 endif
138 BIOS_PATH             ?=$(PSDK_INSTALL_PATH)/bios_6_83_02_07"
139 XDCTOOLS_PATH         ?=$(PSDK_INSTALL_PATH)/xdctools_3_61_04_40_core"
140 IVISION_PATH          ?=$(PSDK_INSTALL_PATH)/ivision"
141 DSP_TOOLS             ?=$(PSDK_TOOLS_PATH)/ti-cgt-c7000_${(CGT_C7X_VERSION)}"
142 MMALIB_PATH           ?=$(PSDK_INSTALL_PATH)/mmalib_${(MMALIB_VERSION)}"
143 PDK_INSTALL_PATH      ?=$(PSDK_INSTALL_PATH)/pdk_jacinto_09_00_01_04/packages"
144 CONCERTO_ROOT         ?=$(PSDK_BUILDER_PATH)/concerto
145 MCU_PLUS_SDK_PATH     ?=$(PSDK_INSTALL_PATH)/mcu_plus_sdk
146 TIOVX_PATH            ?=$(PSDK_INSTALL_PATH)/tiovx
147 VISION_APPS_PATH      ?=$(PSDK_INSTALL_PATH)/vision_apps
148 GCC_LINUX_ARM_ROOT    ?=$(PSDK_TOOLS_PATH)/arm-gnu-toolchain-11.3.rel1-x86_64-aarch64-none-linux-gnu
149 LINUX_FS_PATH         ?=$(PSDK_INSTALL_PATH)/targetfs
150 TVM_HOME              ?=$(PSDK_INSTALL_PATH)/tvm
151 TF_REPO_PATH          ?=$(PSDK_INSTALL_PATH)/tensorflow
152 ONNX_REPO_PATH        ?=$(PSDK_INSTALL_PATH)/targetfs/usr/include/onnxruntime
153
154 # Below are only needed for PC emulation Test bench build
155 TIDL_OPENCV_PATH      ?=$(PSDK_INSTALL_PATH)/opencv-4.1.0"
156 TIDL_PROTOBUF_PATH    ?= $(PSDK_INSTALL_PATH)/protobuf-3.11.3
157 TIDL_FLATBUF_PATH     ?=$(PSDK_INSTALL_PATH)/flatbuffers-1.12.0"
158 TIDL_GRAPHVIZ_PATH   ?= "/usr"
```

- In this i change the directory path for the tensorflow and see the PSDK\_TOOLS\_PATH , it will be helpful in upcoming process

```
cd ${PSDK_INSTALL_PATH}
cd sdk_builder/
make tidl_pc_tools -j # I have a 8GB RAM so i can't completely run this
```

```
process so i just used j2 in the place of j  
make
```

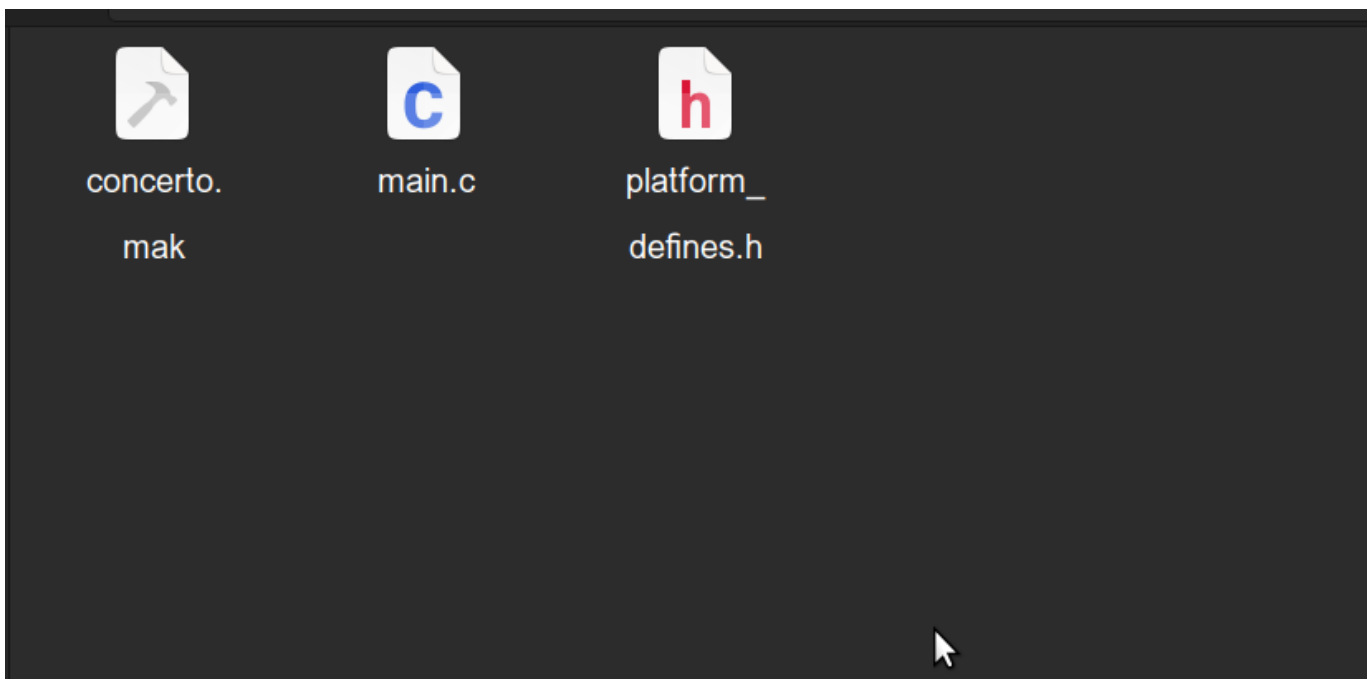
## Build command to run TIDL-RT

```
cd ${TIDL_INSTALL_PATH}  
make TARGET_PLATFORM=PC  
make
```

## Running Custom Test App

- Go to the directory

```
cd ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-  
tidl/ti_dl/test/src/pc_linux/
```



- In this , delete platform\_defines.h file and modify the main.c program with the hello\_world.c

```
#include<stdio.h>  
int main(){  
    printf("Hello World");  
    return 0;  
}
```

- In ti-processor-sdk-rtos-j721e-evm-09\_00\_01\_01/c7x-mma-tidl/ti\_dl/test/src/concerto\_common.mak comment out the following code

```
TIDL_TB_FILES += tidl_tb.c
TIDL_TB_FILES += tidl_rt.c
TIDL_TB_FILES += tidl_tb_utils.c
TIDL_TB_FILES += tidl_config.c
TIDL_TB_FILES += tidl_image_postproc.c
TIDL_TB_FILES += tidl_image_preproc.c
TIDL_TB_FILES += tidl_image_read_write.c
TIDL_TB_FILES += tidl_lidar_preproc.c
```

```
4 # This is relative to the plat directory
5 # This section lists ti_dl/test/src/*.c files
6 # needed by all platforms
7 # TIDL_TB_FILES += tidl_tb.c
8 # TIDL_TB_FILES += tidl_rt.c
9 # TIDL_TB_FILES += tidl_tb_utils.c
10 # TIDL_TB_FILES += tidl_config.c
11 # TIDL_TB_FILES += tidl_image_postproc.c
12 # TIDL_TB_FILES += tidl_image_preproc.c
13 # TIDL_TB_FILES += tidl_image_read_write.c
14 # TIDL_TB_FILES += tidl_lidar_preproc.c
15
```

- Go to the ti-processor-sdk-rtos-j721e-evm-09\_00\_01\_01/c7x-mma-tidl/ti\_dl/test/ directory and run the following command

```
make TARGET_BUILD=debug TARGET_PLATFORM=PC
```

- To run the output code

```
cd ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-
tidl/ti_dl/test/out/PC/x86_64/LINUX/debug/
./PC_dsp_test_dl_algo.out
```

## Error I got

---

### 1. memset error while do the makefile for flatbuffer

```

58%] Building CXX object CMakeFiles/flatbuffers.dir/tests/test.cpp.o
In file included from /home/alex/C7x/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-tidl/flatbuffers-1.12.0/tests,
/home/alex/C7x/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-tidl/flatbuffers-1.12.0/tests/arrays_test_generated,
/home/alex/C7x/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-tidl/flatbuffers-1.12.0/tests/arrays_test_generated.
struct MyGame::Example::NestedStruct'; use assignment or value-initialization instead [-Werror=class-memaccess]
156 |         std::memset(d_, 0, sizeof(d_));
    |         ~~~~~^~~~~~
/home/alex/C7x/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-tidl/flatbuffers-1.12.0/tests/arrays_test_generated.
66 |     FLATBUFFERS_MANUALLY_ALIGNED_STRUCT(8) NestedStruct FLATBUFFERS_FINAL_CLASS {
    |     ~~~~~^~~~~~
c1plus: all warnings being treated as errors
make[2]: *** [CMakeFiles/flatbuffers.dir/build.make:178: CMakeFiles/flatbuffers.dir/tests/test.cpp.o] Error 1
make[1]: *** [CMakeFiles/Makefile2:175: CMakeFiles/flatbuffers.dir/all] Error 2
make: *** [Makefile:166: all] Error 2
loves@DESKTOP-FDE7C78: ~/C7x/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-tidl/flatbuffers-1.12.0$ cd

```

- While doing cmake , add the following flag

```

cmake -G "Unix Makefiles" -DCMAKE_BUILD_TYPE=Release -DCMAKE_CXX_FLAGS="-
Wno-class-memaccess"
# Then run make
make

```

## 2. Tensorflow command

while running make TARGET\_PLATFORM=PC command in buildinf TIDL\_RT , it says that tensorflow is not found

- To solve this , go to the ti-processor-sdk-rtos-j721e-evm-09\_00\_01\_01/c7x-mma-tidl/makerules/config.mk and change the

```

TF_REPO_PATH?=$(PSDK_INSTALL_PATH)/targetfs/usr/include/tensorflow

To

TF_REPO_PATH ?=$(PSDK_INSTALL_PATH)/tensorflow

```

```

150 TVM_HOME           ?=$(PSDK_INSTALL_PATH)/tvm
151 TF_REPO_PATH       ?=$(PSDK_INSTALL_PATH)/tensorflow
152 ONNX_REPO_PATH     ?=$(PSDK_INSTALL_PATH)/targetfs/usr/include/onnxruntime
153

```

## 3. c7x.h is not loaded

```

from src/tidl_batchReshape.c:71:
/home/arshathahamed10/PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-tidl/mmalib/src/cnn_c7xmma/MMALIB_CNN_convolve_col_smallNo_ixX_ixX_oxX/../../common
/MMALIB_types.h:35:10: fatal error: c7x.h: No such file or directory
 35 | #include <c7x.h> // for streaming engine, streaming address gen.
    |
compilation terminated.
make[2]: *** [/home/arshathahamed10/PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-tidl/makerules/rules.mk:501: /home/arshathahamed10/PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-tidl/out/PC/dsp/algo/release/ti_d1/algo/src/priv/./tidl_algo_workload.obj] Error 1
make[2]: Leaving directory '/home/arshathahamed10/PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-tidl/ti_d1/algo/src/priv'
make[1]: *** [makefile:192: tidl_priv] Error 2
make[2]: *** [/home/arshathahamed10/PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-tidl/makerules/rules.mk:501: /home/arshathahamed10/PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-tidl/out/PC/dsp/algo/release/ti_d1/algo/./src/tidl_batchReshape.obj] Error 1
compiling ../tfimport/proto_cc/tensorflow/core/framework/op_def.pb.cc
In file included from /home/arshathahamed10/PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/mmalib_09_00_03_03/ti/mmalib/src/cnn_c7xmma/MMALIB_CNN_convolve_col_smallNo_ixX_ixX_oxX/MMALIB_CNN_convolve_col_smallNo_ixX_ixX_oxX.h:25,
      from /home/arshathahamed10/PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/mmalib_09_00_03_03/ti/mmalib/src/cnn_c7xmma/mmalib_cnn.h:26,
      from ./inc/tidl_alg_int.h:88,
      from src/tidl_argmax.c:73:
/home/arshathahamed10/PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/mmalib_09_00_03_03/ti/mmalib/src/cnn_c7xmma/MMALIB_CNN_convolve_col_smallNo_ixX_ixX_oxX/../../common
/MMALIB_types.h:35:10: fatal error: c7x.h: No such file or directory
 35 | #include <c7x.h> // for streaming engine, streaming address gen.
    |
compilation terminated.
compiling ../tfimport/proto_cc/tensorflow/core/framework/resource_handle.pb.cc
make[2]: *** [/home/arshathahamed10/PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-tidl/makerules/rules.mk:501: /home/arshathahamed10/PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-tidl/out/PC/dsp/algo/release/ti_d1/algo/./src/tidl_argmax.obj] Error 1
compiling ../tfimport/proto_cc/tensorflow/core/framework/step_stats.pb.cc
In file included from /home/arshathahamed10/PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/mmalib_09_00_03_03/ti/mmalib/src/cnn_c7xmma/MMALIB_CNN_convolve_col_smallNo_ixX_ixX_oxX/MMALIB_CNN_convolve_col_smallNo_ixX_ixX_oxX.h:25,
      from /home/arshathahamed10/PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/mmalib_09_00_03_03/ti/mmalib/src/cnn_c7xmma/mmalib_cnn.h:26,
      from ./inc/tidl_alg_int.h:88,
      from src/tidl_batchNorm.c:73:
/home/arshathahamed10/PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/mmalib_09_00_03_03/ti/mmalib/src/cnn_c7xmma/MMALIB_CNN_convolve_col_smallNo_ixX_ixX_oxX/../../common
/MMALIB_types.h:35:10: fatal error: c7x.h: No such file or directory
 35 | #include <c7x.h> // for streaming engine, streaming address gen.
    |

```

- For this i download the c7x dsp compiler by manual from this [link](#)
- create a **ti** directory in the home and store the file and run the command

```
./ti_cgt_c7000_4.1.0.LTS_linux-x64_installer.bin
```

- See the path is stored in config.mk

```

108 PSDK_TOOLS_PATH      ?= "C:/ti"
109 BIOS_PATH            ?= "${PSDK_I

```

## 4. Running the test makefile

It didnt genetate PC\_dsp\_test\_d1\_algo.out file in ti-processor-sdk-rtos-j721e-evm-09\_00\_01\_01/c7x-mma-tidl/ti\_d1/test/out/PC/x86\_64/LINUX/debug/ directory

```

arshathahamed10@arshathahamed10-IdeaPad-3-15T1LE: /PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-tidl/ti_d1/test$ make TARGET_BUILD=debug TARGET_PLATFORM=PC
SHELL=/bin/sh
TARGET_MAKEFILES=src/dsp_rtos/concerto.mak src/pc_linux/concerto.mak
Keep only PC platform in TARGET_COMBO5
Keep only debug BUILD5 in TARGET_COMBO5
undefined TIARMCGT_ROOT=
undefined TIARMCGT_LLVM_ROOT=
undefined GCC_SYSBIOS_ARM_ROOT=
undefined CGT6X_ROOT=
File CGT7X_ROOT=/home/arshathahamed10/ti/ti-cgt-c7000_4.1.0.LTS*
undefined GCC_LINUX_ROOT=
File GCC_LINUX_ROOT=/usr
undefined GCC_QNX_ROOT=
#####
TARGET_COMBO=PC:Linux:x86_64:1:debug:GCC_LINUX
Required system library libtidl_custom.a
Required system library libtidl_algo.a
Required system library libtidl_obj_algo.a
Required system library libtidl_priv_algo.a
Required system library libmmalib_cn_x86_64.a
Required system library libmmalib_x86_64.a
Required system library libcommon_x86_64.a
Required system library libc7100-host-emulation.a
Required system library libopenv_ingproc.a
Required system library libopenv_ingcodecs.a
Required system library libopenv_core.a
Required system library liblibtiff.a
Required system library liblibwebp.a
Required system library liblibpng.a
Required system library liblibjpeg-turbo.a
Required system library liblibinf.a
Required system library libzlib.a
Required system library liblibjasper.a
Required system library libtidl_avx_kernels.a
Required system library libtidl.so
Linking /home/arshathahamed10/PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-tidl/ti_d1/test/out/PC/x86_64/LINUX/debug/PC_dsp_test_d1_algo.out
/usr/bin/ld: cannot find -ltidl_custom: No such file or directory
/usr/bin/ld: cannot find -ltidl_priv_algo: No such file or directory
/usr/bin/ld: cannot find -libinf: No such file or directory
/usr/bin/ld: cannot find -ltidl_avx_kernels: No such file or directory
collect2: error: ld returned 1 exit status
make: [/home/arshathahamed10/PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/sdk_builder/concerto/finalize.mak:216: /home/arshathahamed10/PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-tidl/ti_d1/test/out/PC/x86_64/LINUX/debug/PC_dsp_test_d1_algo.out] Error 1 (ignored)
Copying built libraries: /home/arshathahamed10/PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-tidl/ti_d1/test/out/PC/x86_64/LINUX/debug to /home/arshathahamed10/PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-tidl/ti_d1/test/lib/PC/x86_64/LINUX/debug
arshathahamed10@arshathahamed10-IdeaPad-3-15T1LE: /PSDKRA/ti-processor-sdk-rtos-j721e-evm-09_00_01_01/c7x-mma-tidl/ti_d1/test$

```



- Solution is we need to comment some line in ti-processor-sdk-rtos-j721e-evm-09\_00\_01\_01/c7x-mma-tidl/ti\_dl/test/src/pc\_linux/concerto.mak

```
68 # STATIC_LIBS += tidl_custom
71 # STATIC_LIBS += tidl_algo
72 # STATIC_LIBS += tidl_obj_algo
73 # STATIC_LIBS += tidl_priv_algo
116 # STATIC_LIBS += IlmImf
126 # STATIC_LIBS += tidl_avx_kernels
```