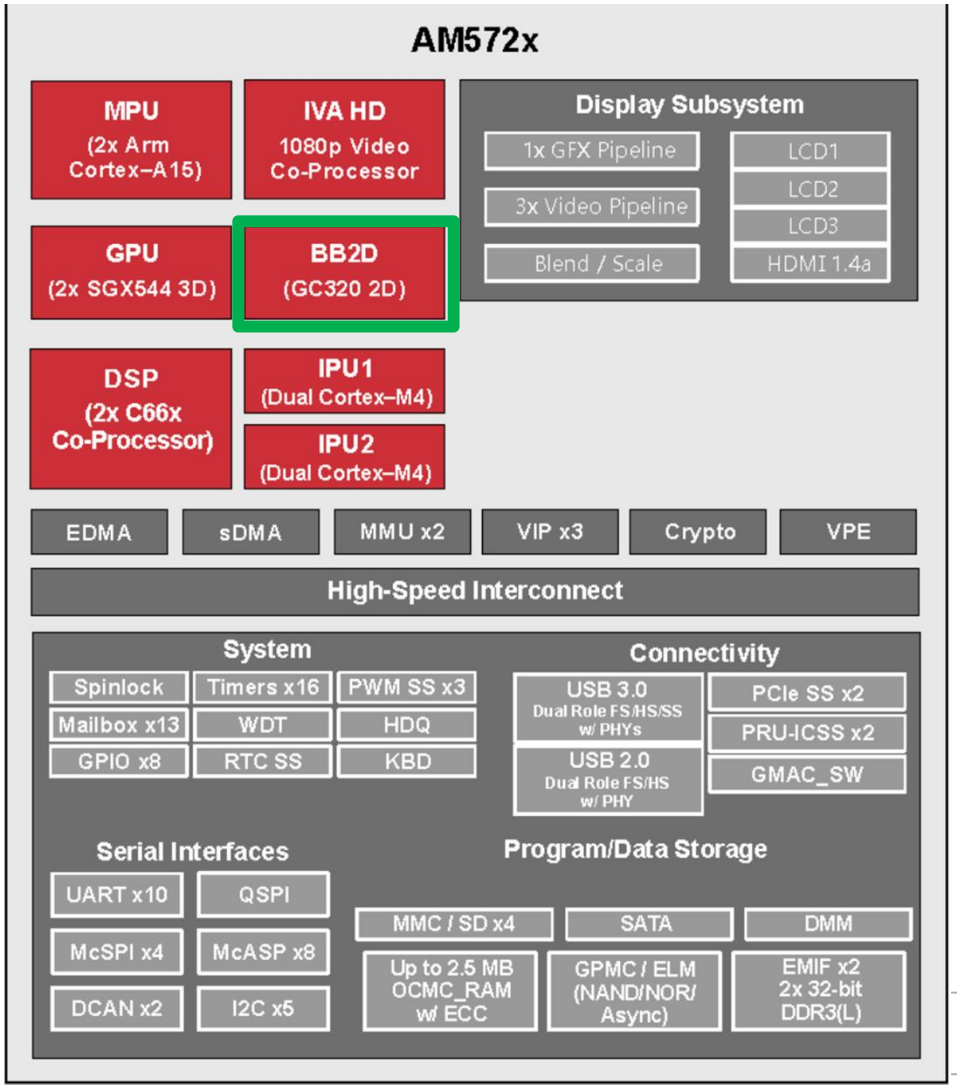
Introduction to GC320 (2D Graphics Accelerator)

Agenda

- GC320 IP
  - Features
- GC320 Software Components
  - Kernel driver
  - Libraries and Unittests
- Unittests
  - Running an example



- Advanced bit blitter 2D graphics acceleration engine
- GC320 core from Vivante Corp. (now VeriSilicon Holdings Co.)
- Available in AM57xx SoC family

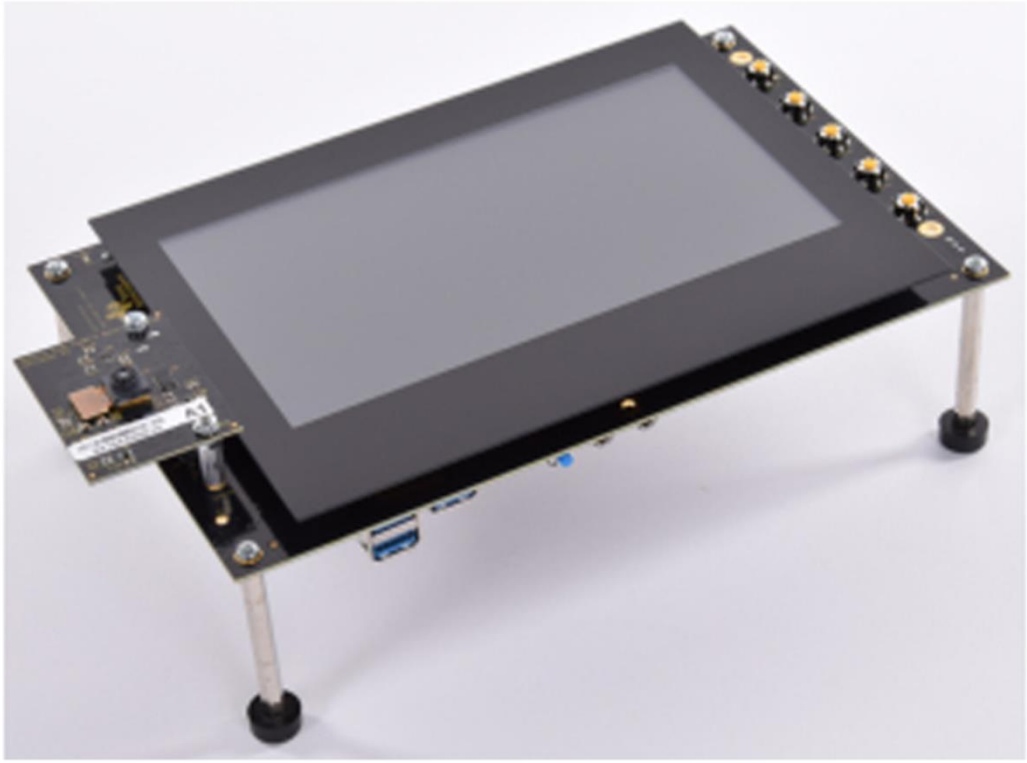
GC320 features

- **Rotation**
  - 90 / 180 / 270 / X Flip / Y Flip / Mirror
- **Color conversion**
  - YUV to RGB conversion
- **Alpha blending**
  - Porter-Duff composition rules
- **Multi Source Blit**
  - Blitting/blending of up to 8 sources in single pass
- **Bit Blit**
  - ROP2, ROP3 and ROP4 support
- **Stretch/Filter Blit**
  - non-interpolated scaling

GC320 software components

- Please refer to following GC320 related packages
  - ti-gc320-driver
    - http://git.ti.com/graphics/ti-gc320-driver
    - kernel driver
  - ti-gc320-libs
    - http://git.ti.com/graphics/ti-gc320-libs
    - user space libraries providing interface to Vivante 2D API
  - ti-gc320-test
    - http://git.ti.com/graphics/ti-gc320-test
    - collection of unit-tests

Test setup



Hardware-

1. AM5728 GPEVM

Software-

1. PSDK 5.2 available at the following link: http://www.ti.com/tool/processor-sdk-am57x

2. Clone the project in the following link: http://git.ti.com/graphics/ti-gc320-test
   a) Branch name “ti-5.0.11.p7”

Software modifications (1/2)

Build Script Variables:

```
export S=${PWD}
export AQROOT=${S}/tests/src
export CROSS_COMPILE=${S}/../ti-processor-sdk-linux-am57xx-evm-
05.02.00.10/linux-devkit/sysroots/x86_64-arago-linux/usr/bin/arm-linux-
gnueabihf-
export ARCH_TYPE=arm
export CPU_TYPE=cortex-a15
export VIVANTE_SDK_INC=${S}/sdk/include
export SDK_DIR=${S}/build/tests
export EGL_API_FB=1
export UNIT_ROOT=$AQROOT/test/hal/common/UnitTest

cd $UNIT_ROOT
make -f makefile.linux clean
make -f makefile.linux
```

Software modifications (2/2)

Modify the file: ti-gc320-test/tests/src/test/hal/common/UnitTest/makefile.linux.def

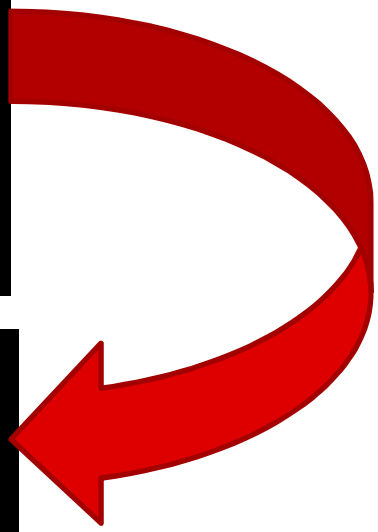
```
################################################################################
# Include the default definitions.

include $(AQROOT)/makefile.linux.def

################################################################################
# Macros.

UNIT_ROOT = $(AQROOT)/test/hal/common/UnitTest
LIB_GAL_DIR = $(SDK_DIR)/drivers
LIB_2DUTS_DIR = $(SDK_DIR)/samples/hal/unit_test
LIBS += -L $(VIVANTE_SDK_LIB) -lGAL -L $(LIB_2DUTS_DIR) -lgalUtil -lm

################################################################################
```



```
################################################################################
# Macros.

UNIT_ROOT = $(AQROOT)/test/hal/common/UnitTest
LIB_GAL_DIR = $(SDK_DIR)/drivers
LIB_2DUTS_DIR = $(SDK_DIR)/samples/hal/unit_test
LIBS += -L $(VIVANTE_SDK_LIB) -lGAL -L $(UNIT_ROOT)/galUtil/bin_r -lgalUtil -lm

################################################################################
```

Building the tests

- **Step 1:** Run the build script from the top directory
- **Step 2:** Navigate to the folder, “ti-gc320-test/tests/src/test/hal/common/UnitTest/ galRunTest2/bin_r” and copy “galRunTest2” to the <SD_CARD/rootfs>or <targetNFS> /usr/bin/GC320/tests/unit_test
- **Step 3:** Navigate to the folder, “ti-gc320-test/tests/src/test/hal/common/units/gal2D/rotation/001/bin_r” and copy “libgal2DRotation001.so” to the <SD_CARD/rootfs>or <targetNFS> /usr/bin/GC320/tests/unit_test
- **Step 4:** Navigate to the folder, “ti-gc320-test/tests/src/test/hal/common/UnitTest/ and copy the “resource” folder to the <SD_CARD/rootfs>or <targetNFS> /usr/bin/GC320/tests/unit_test
- **Step 5:** Navigate to the folder, “ti-gc320-test/tests/src/test/hal/common/UnitTest/ galUtil/bin_r” and copy “libgalUtil.so” to the <SD_CARD/rootfs>or <targetNFS> /usr/bin/GC320/tests/unit_test

Running the test

1. Power on the GPEVM
2. Navigate to the directory “/usr/bin/GC320/tests/unit_test/”
3. insmod /lib/modules/4.14.79-gbde58ab01e/extra/galcore.ko baseAddress=0x80000000 physSize=0x80000000
4. export LD_LIBRARY_PATH=`pwd`
5. ./galRunTest2 libgal2DRotation001.so -c ./galTestCommon.cfg
6. Resulting image located in the result directory

For more information

- Advanced example: http://software-dl.ti.com/processor-sdk-linux/esd/docs/latest/linux/Examples_and_Demos_Application_Demos.html#video-graphics-test
- PSDK Linux: http://www.ti.com/tool/processor-sdk-am57x
- Tests Link: http://git.ti.com/graphics/ti-gc320-test
- For questions about this training, refer to the E2E Community Forums for Sitara Processors at https://e2e.ti.com/support/processors/f/791

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