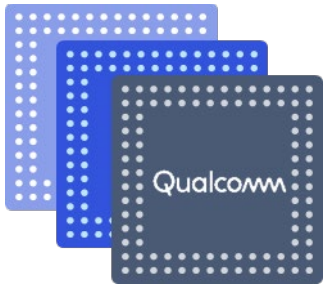
SA8295 HQX Camera Overview

Qualcomm
Qualcomm Technologies, Inc.

80-PM164-82 Rev. AA



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Revision History

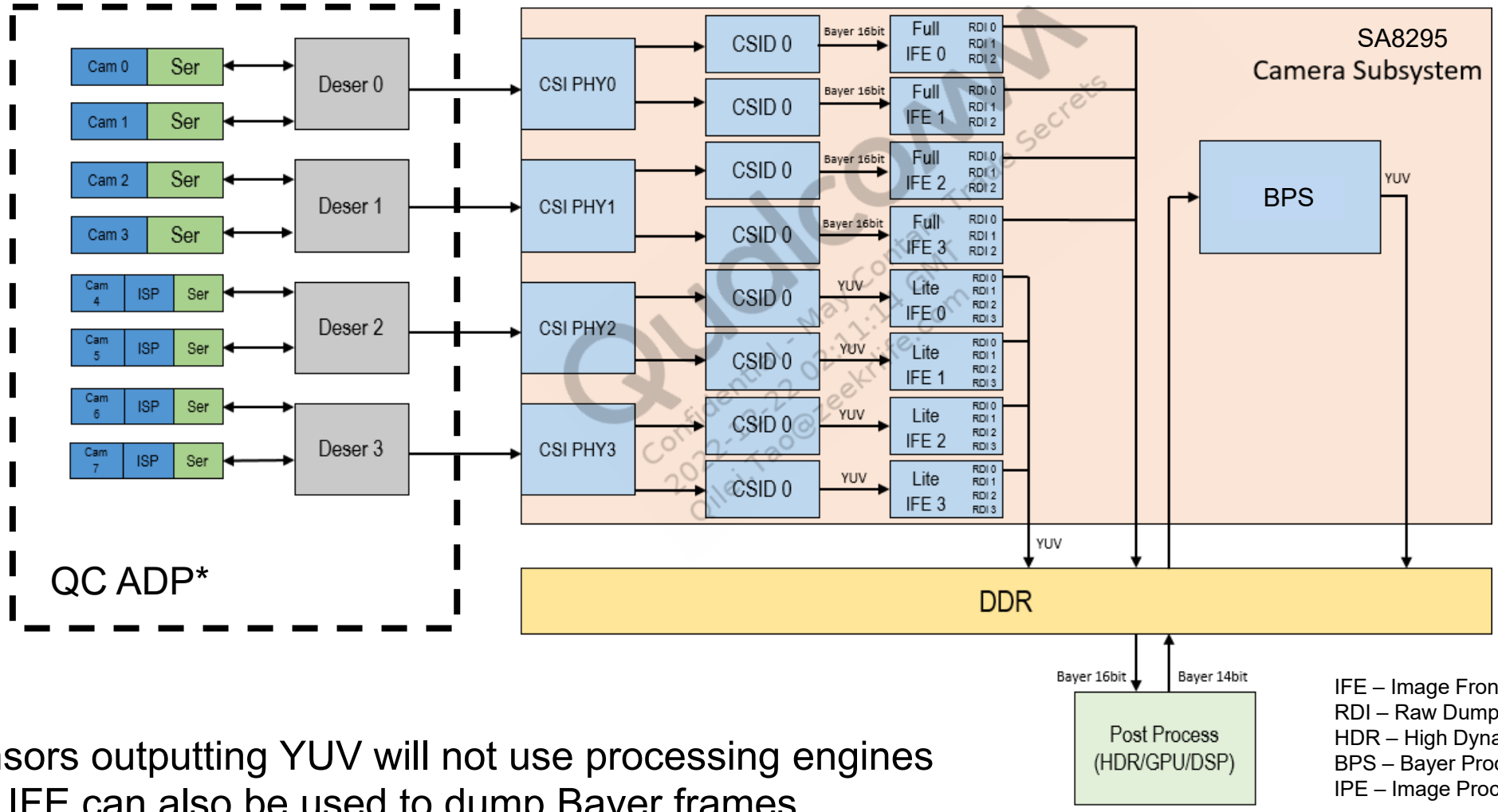
Revision	Date	Description
AA	May 2022	Initial release

Introduction

- This document describes how to configure the automotive imaging system (AIS) on HQX automotive platforms. It details the following:
  - AIS architecture
  - Data flow between AIS client and server running on GVM
  - Camera driver porting and source files
  - Basic API calls

Hardware Architecture

- Shown with 4 sensors outputting Bayer and 4 sensors outputting YUV



IFE – Image Front End
RDI – Raw Dump Interface
HDR – High Dynamic Range
BPS – Bayer Processing Segment
IPE – Image Processing Engine

- Sensors outputting YUV will not use processing engines
- Lite IFE can also be used to dump Bayer frames

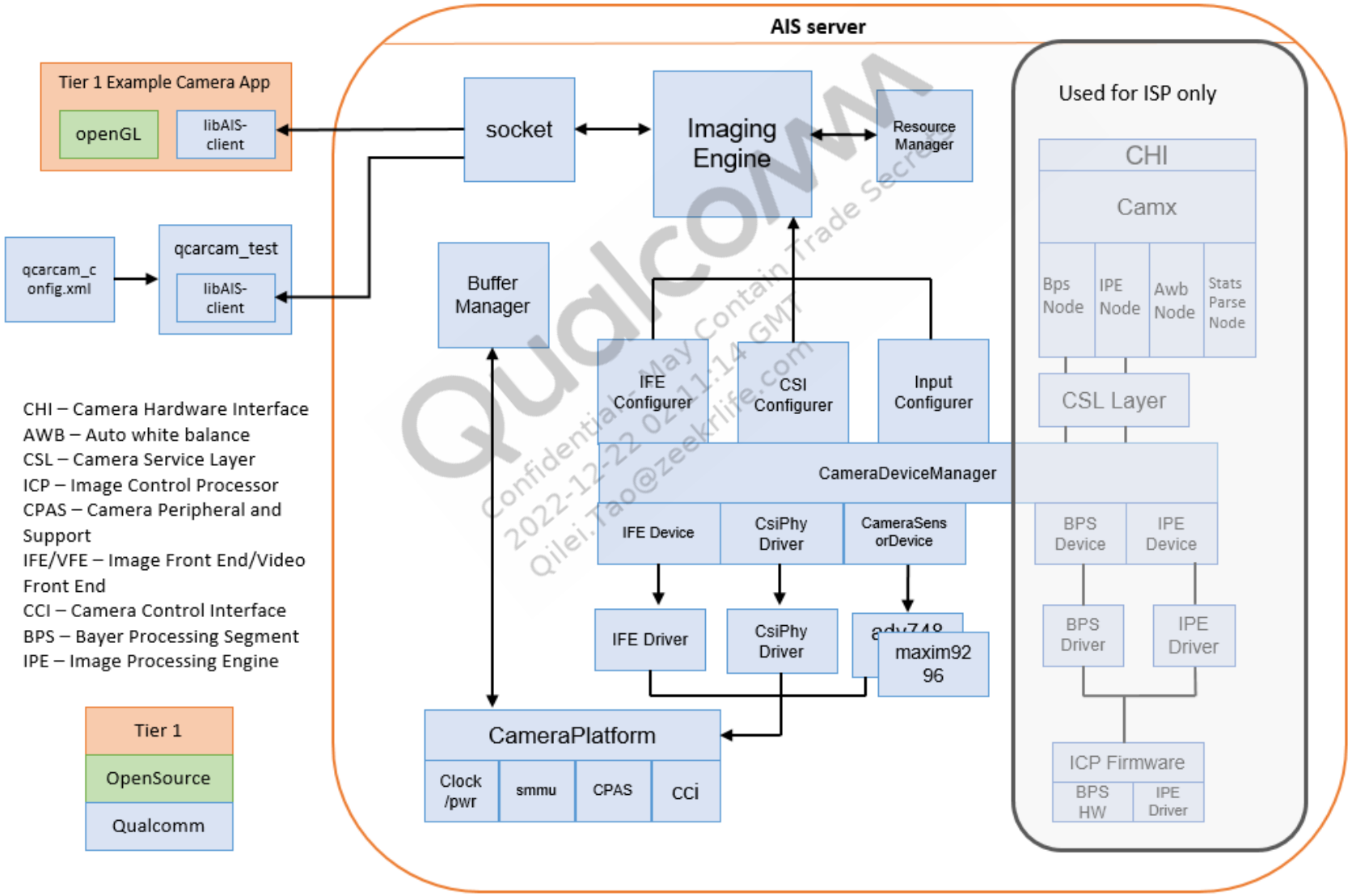
Hardware Features in Camera*

	SA8295	SA8155
Camera interfaces (CSID)	▪ 8 CSID ports ▪ MIPI Combo C/D-PHY 4/4/4/4 ▪ D-PHY – 2.5 Gbps/lane ▪ C-PHY – 5.71 Gbps/trio	▪ 4 CSID ports ▪ MIPI Combo C/D-PHY 4/4/4/4 ▪ D-PHY – 2.5 Gbps/lane ▪ C-PHY – 5.71 Gbps/trio
Sensor driver support**	▪ LI-AR0231	▪ LI-AR0231
Deserializer driver support**	▪ MAXIM 96712	▪ MAXIM 9296
IFEs	▪ 4x Lite IFE ▪ 4x Full IFE	▪ 2x Lite IFE ▪ 2x Full IFE
Raw Dump Interfaces (RDI)	▪ Each Lite IFE can support up to 4 RDI streams simultaneously ▪ Each Full IFE can support up to 3 RDI streams simultaneously	▪ Each Lite IFE can support up to 4 RDI streams simultaneously ▪ Each Full IFE can support up to 3 RDI streams simultaneously
ISP	▪ HDR via DSP/GPU ▪ Bayer processing via BPS ▪ Add'l post processing via BPS/IPE	

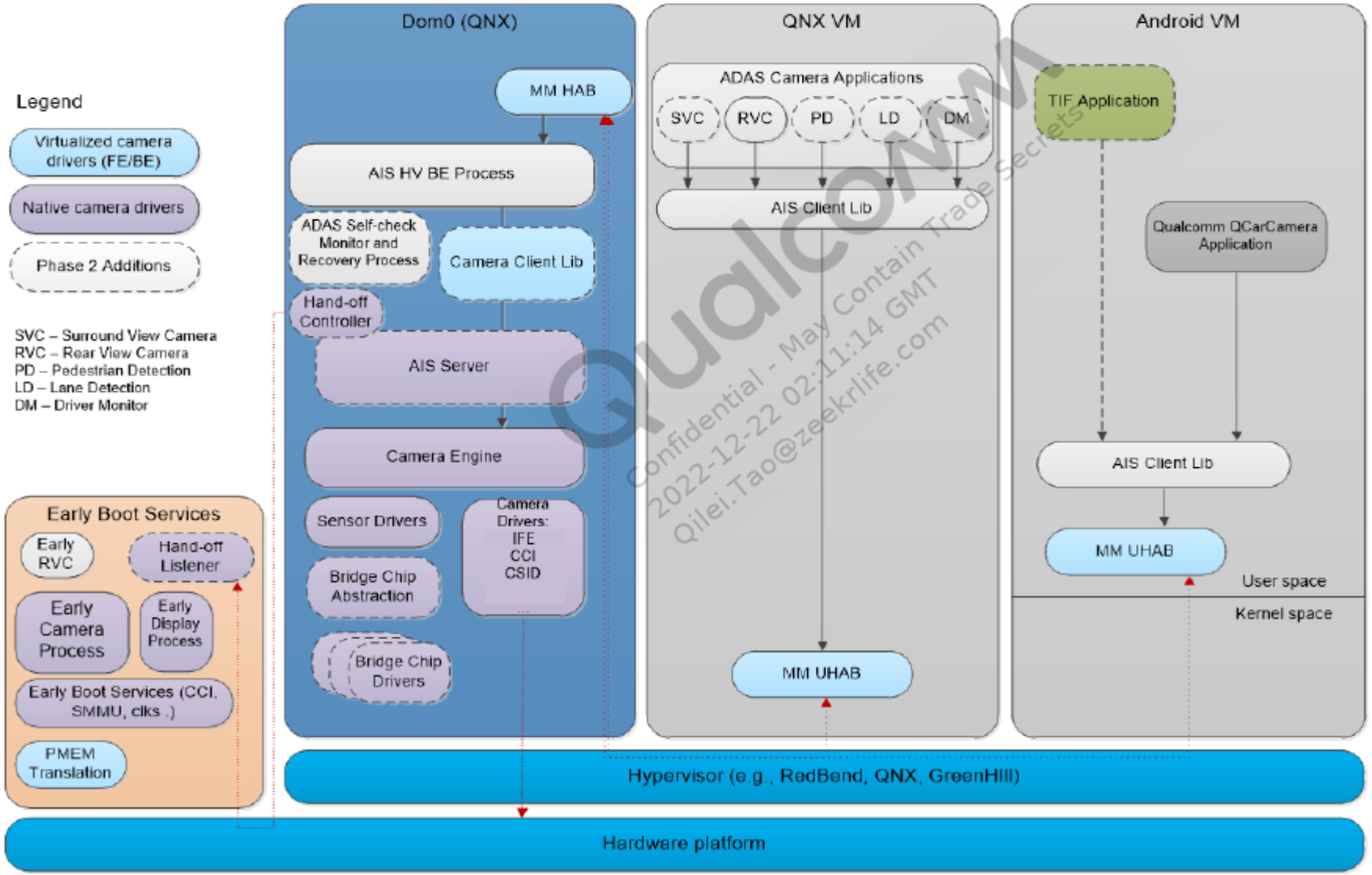
* Hardware capability does not guarantee software support. Check with local CE for clarification on software support.

** Other sensors and deserializers are supported, but drivers are not provided.

Automotive Imaging System



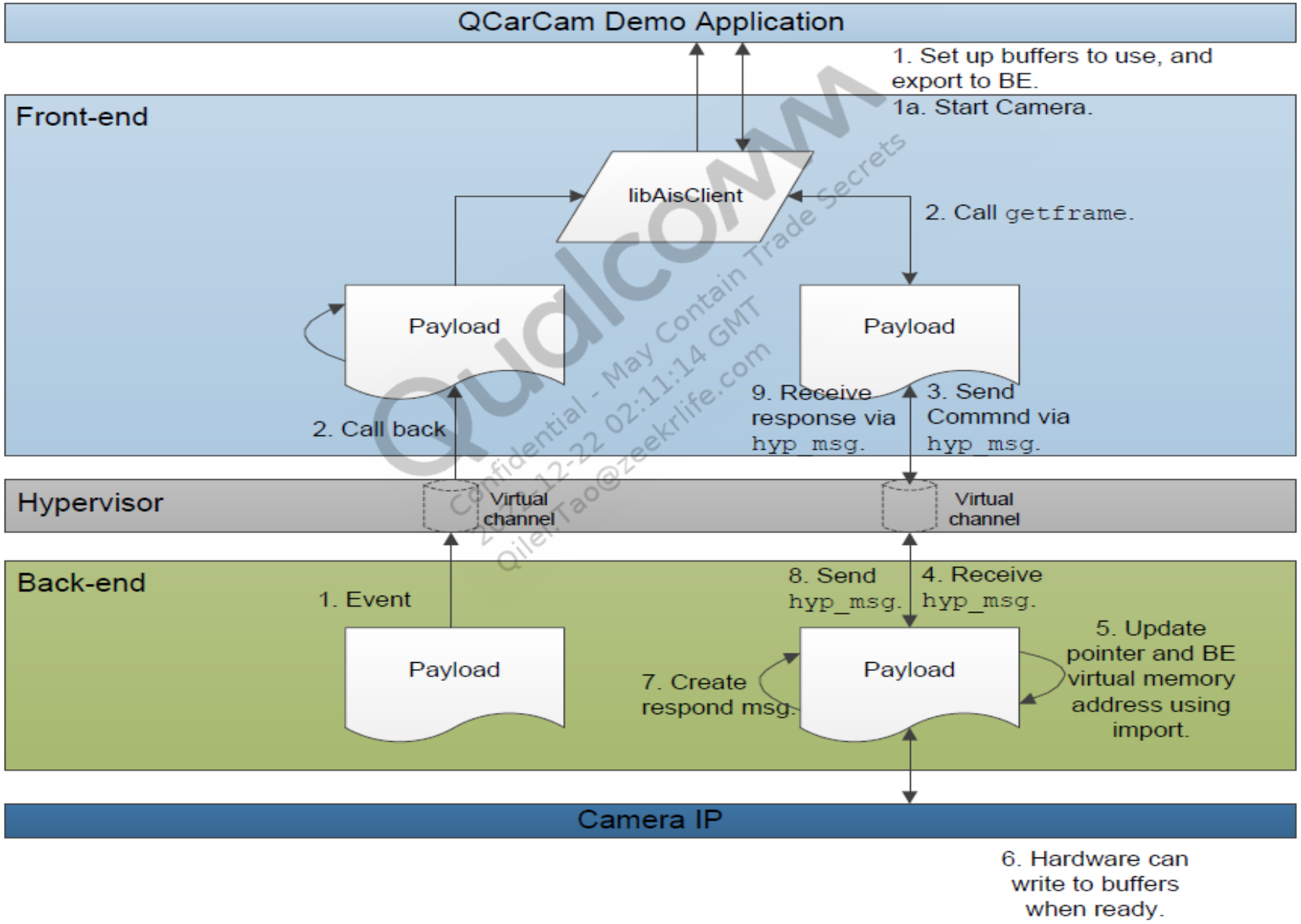
Hypervisor/GVM Solution



HAB
Hypervisor Abstract Communication driver

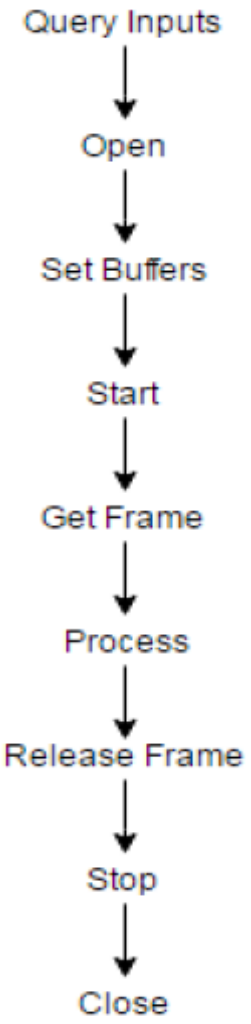
habmm_socket_open
Tag: **MM_CAM_1**

Hypervisor Camera Application Data Flow



AIS Client Application

- QCarCam is the QTI automotive proprietary API



QCarCam call flow

QCarCam API – Test App

- The qcarcam_test native demo applications are executable over the terminal to quickly test the QCarCam API

Parameter	Description	Example
config	Specify qcarcam_config.xml file location	config=/bin/camera/qcarcam_test/ qcarcam_config.xml
dumpFrame	Enable frame dump every X frames	dumpFame=50
startStop	Start/Stop every X frames	startStop=50
pauseResume	Pause/Resume every X frames	pauseResume=50
noDisplay	Run without displaying frames on the display	noDisplay
singlethread	Run qcarcam_test on a single thread	singlethread
printfps	Print average frames per second every X seconds	printfps=10

- Android:

```
adb root
adb remount
adb shell
//one camera test for camera at channel 0
qcarcam_test -config=/vendor/bin/1cam.xml
```

- QNX:

```
To run the demo application on QNX:
cd bin/camera/qcarcam_test
// one camera test for camera at channel 0
./qcarcam_test -config=1cam.xml
```

- See release notes for latest qcarcam_test and config file details

Debugging – Increasing Log Level

- In `multimedia\camera\ais\Common\src\ais_log.c`:

```
  @@ -133,7 +133,7 @@ PUBLIC_API const char
   *AIS_LOG_LVL_STR[AIS_LOG_LVL_MAX_NUM] =
   #elif defined(CAMERA_UNITTEST)
   #define AIS_LOG_DEFAULT_CONF AIS_LOG_CONF_MAKE(AIS_LOG_MODE_CONSOLE,
AIS_LOG_LVL_WARN)
   #else
   -#define AIS_LOG_DEFAULT_CONF AIS_LOG_CONF_MAKE(AIS_LOG_MODE_OS, AIS_LOG_LVL_HIGH)
   +#define AIS_LOG_DEFAULT_CONF AIS_LOG_CONF_MAKE(AIS_LOG_MODE_FILE,
AIS_LOG_LVL_DBG)

Dump files are under /tmp

QNX:
slog2info > dump.log
```

Customization

- Most customization requirements are to change the types of camera and bridge chips. shows a submodule, sensor drivers, which contains the following:
  - Max96712_lib
    AR0231

- Max96712_lib is the bridge chip driver
- AR0231 is the sensor driver
- Users can modify these source files to port to a new type of bridge chip and camera module. The file cameraconfigsa8295.c contains structures to define camera information including ID and connection relationship.
- See *SA6155/SA8155/SA8195 Automotive Camera AIS Customization Guide* (80-PG469-93) for bringup procedures

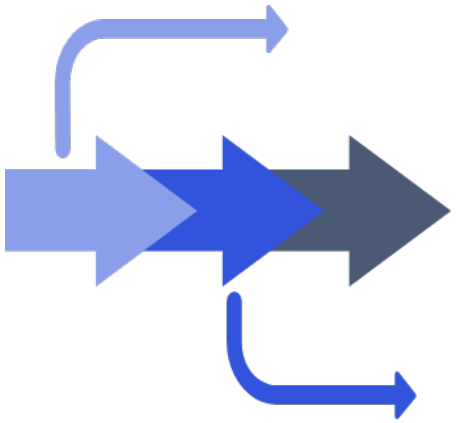
Customization (cont.)

- File locations in this section use QNX as an example
- For each block, refer to the following locations:
  - Sensor driver location: AMSS\multimedia\camera\ais\ImagingInputs\SensorLibs\
  - Camera_config.so is built from AMSS\multimedia\camera\ais\CameraConfig\src\
  - AIS_client and AIS_server: AMSS\multimedia\camera\ais\CameraMulticlient\
  - Camera platform lib: AMSS\multimedia\camera\ais\CameraPlatform\
  - Camera imaging engine, managers, and configurers: AMSS\multimedia\camera\ais\Engine\
  - Hardware driver API: AMSS\multimedia\camera\ais\HWDrivers\
  - Application tests (for example, qcarcam_test): AMSS\multimedia\camera\ais\test\

References

Documents	
Title	**Number**
Qualcomm Technologies, Inc.	
SA6155/SA8155/SA8195 Automotive Camera AIS Customization Guide	80-PG469-93

Acronyms	
Acronym or term	**Definition**
AIS	Automotive imaging system
RDI	Raw dump interfaces



Questions?

https://createpoint.qti.qualcomm.com