Linux QMI SDK

Application Developer's Guide

SIERRA WIRELESS®

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1.01	October 05, 2011	Added section 5.4: Connection Manager Sample Application; Updated sections 3.1, 4.2, 4.3, 5.2, 5.3
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1.32	Jun 19, 2020	Update Section 3.2 Update Section 5.3.5 Update Section 5.4.3 Update Section 5.4.6 Add Section 6.6 One command Line Firmware Downloader Sample Application
2.0	Oct 05,2020	Update Section 3.2 Update Section 5.4.3 Update Section 5.4.5 For customer release

Contents

1. Abbreviations and Definitions

Abbreviation/Acronym	Definitions
MSM	Mobile Station Modem
PRI	Product Release Instructions
QMI	Qualcomm MSM Interface
SLQS	Sierra Linux QMI SDK
WP	Work Package
SDK	Software Development Kit
SQF	Sierra Filter File
QDL	Qualcomm download mode
Image	Modem Firmware Image

2. Introduction

QMI is a binary protocol designed to replace the AT command-based communication with modems. This protocol is used by some Sierra Wireless modules based on Qualcomm chipsets.

From Linux QMI SDK 4 version, two different architectures can be adopted depending on feature needs and constraints:

- Lite APIs: this is a tiny version adapted to low memory footprint. This layer is only managing QMI messages encoding (request) and decoding (response/indication) through function calls.
- Full APIs: this is a more complete version adapted to less constrained environment. It comes with some processes handling memory allocations, timers, machine-state to provide features such as:
  - Modem detection/scanning
  - Modem mode management: application or boot-hold(firmware download)
  - QMI port multiplex for applications & scheduling
  - Modem firmware update

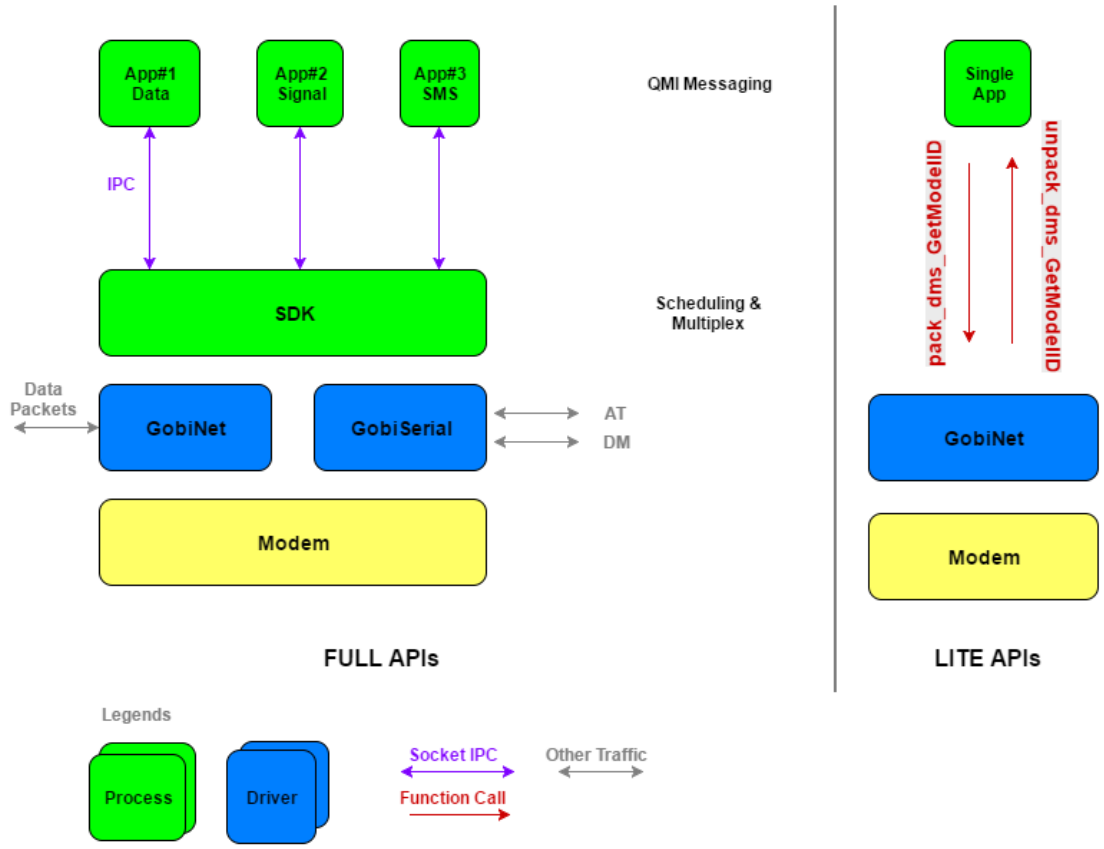


Figure 1. Lite APIs vs Full APIs

3. Prerequisites

3.1. Supported Processors

The following processors are supported:

- x86 (32bit & 64bit)
- ARM
- PPC
- MIPS

3.2. Supported Devices

The following devices are supported:

- MC77xx
- MC83x5
- SL/MC9090
- EM/MC73xx
- AR7554
- EM/MC7430 EM/MC7455
- EM7565 EM7511
- EM74x1
- WP76xx
- RC76xx

Note: MC77xx devices must operate in "QMI Mode" and not in "Direct-IP" mode.

The tables below list the hexadecimal values of the Vendor ID (VID) and Product ID (PID) pairs supported by the QMI SDK.

Table 1. Supported Application-Mode VID/PIDs

VID	1199	1199	1199	1199	1199	1199	3F0	1199	1199	1199	1199	1199	1199
PID	68A2	68C0	9011	9013	9015	9019	371D	9040	9041	9071	9091	90B1	90C1

Table 2. Supported Boot-Mode VID/PIDs

VID	1199	1199	1199	1199	1199	1199	3F0	1199	1199	1199	1199
PID	68A2	68C0	9010	9012	9014	9018	361D	9070	9090	90B0	90C0

To check your device's VID/PID, issue the **`lsusb`** command. The output will present a list of USB devices with a column showing each device's manufacturer. The device VID/PID can be read from the row containing the correct device manufacturer.

Additionally, on MC77xx devices, you can use the **`AT!UDINFO?`** command to check VID/PID information. If your VID/PID does not match the any of the entries in the tables above, contact your FAE for support.

3.3. Device Drivers

3.3.1. Host Setup

The Linux distribution may have built-in drivers and applications that can interfere with SDK process's execution. The following Qualcomm drivers, if present, need to be blacklisted.

- qcserial
- qmi_wwan

Blacklist them as below (the following example is for Ubuntu).

Add two entries to the "`/etc/modprobe.d/blacklist-modem.conf`" file and restart the host

```
blacklist qcserial
blacklist qmi_wwan
```

"Modem Manager" is another application that can interfere with the SDK's operation. Remove it and restart the host. The following example is for an Ubuntu PC:

#sudo apt-get remove modemmanager
#sudo killall -9 modemmanager
#sudo reboot

During firmware upgrade, the SDK process need to read/write modem's serial ports. Make sure there is no background process reading/writing the modem's serial ports at the same time. For example, qmi_daemon.

3.3.2. Acquiring the Drivers

Get in touch with your FAE to acquire drivers for your device if you are operating in QMI mode – the mode of operation required for using the QMI SDK.

3.3.3. Supported Linux Kernels

Sierra Wireless supports open source kernel version 2.6.32 or newer. Both 32 bit and 64-bit versions of Linux/UNIX are supported. It is the customer's responsibility to modify the SDK and drivers for kernels outside the scope of what is supported.

3.3.4. System Dependencies

Make sure you have a network connection and issue the following commands:

```
sudo apt-get install build-essential make gcc
sudo apt-get install linux-headers-`uname -r`
```

3.3.5. Building and Installing the Drivers

```
cd GobiSerial; make; sudo make install
cd GobiNet; make; sudo make install
sudo modprobe GobiSerial [debug=Y]
sudo modprobe GobiNet [debug=Y]
```

EM/MC7430 and EM/MC7455 only support RAWIP mode, please build GobiNet with RAWIP=1 switch

```
cd GobiNet; make RAWIP=1;
```

3.3.6. Querying Driver Versions and Supported Devices

```
modinfo GobiSerial
modinfo GobiNet
```

3.3.7. Unloading the Drivers

```
sudo rmmod GobiSerial
sudo rmmod GobiNet
```

3.3.8. Enabling and Disabling the Drivers' Diagnostic Messages

Note: Enabling and disabling the driver's diagnostic messages requires root privileges.

Enable diagnostic messages:

```
echo 1 > /sys/module/GobiSerial/parameters/debug
echo 1 > /sys/module/GobiNet/parameters/debug
```

Disable diagnostic messages:

```
echo 0 > /sys/module/GobiSerial/parameters/debug
echo 0 > /sys/module/GobiNet/parameters/debug
```

3.3.9. Verifying Proper Driver Operation

1. Open terminal and type tailf /var/log/syslog.
2. Plug in the Sierra Wireless device.
3. Check /dev/ for the existence of the following devices (check syslog in case the device nodes are static i.e. built into the kernel image and not dynamically mounted).

*Note: The second QMI interface is available only when the device is in multi-pdn mode (**/dev/qcqmiy**).*

- /dev/ttyUSB0
- /dev/ttyUSB1
- /dev/ttyUSB2
- /dev/qcqmix where x is an integer starting at 0
- /dev/qcqmiy where y is an integer starting at 0

3.4. Defined Compilation Flags

The following flags are defined for SDK compilation or all architectures "`-Wall -Werror -Wextra`". Specific architectures may have other flags defined.

3.5. Linked Libraries required for Full APIs

- rt
- pthread

4. Full APIs System Architecture

The Full APIs system architecture is described as:

- The application process communicating with the device by executing Full APIs
- The host application which is statically linked to the Full library
- The API calls translated in QMI request SDUs that are sent to the SDK process over a local IPC datagram socket
- The SDK writing the QMI PDUs to a device file named /dev/qcqmix, where x is an integer, associated with the QMI interface
- The QMI PDUs sent to the device over the USB control channel via the GobiNet.ko driver module.
- Notifications received over the interrupt channel, which prompts the driver to read the responses coming over the USB control channel
- The SDK that reads the QMI response from /dev/qcqmix and sends a response to the application process over a local IPC datagram socket

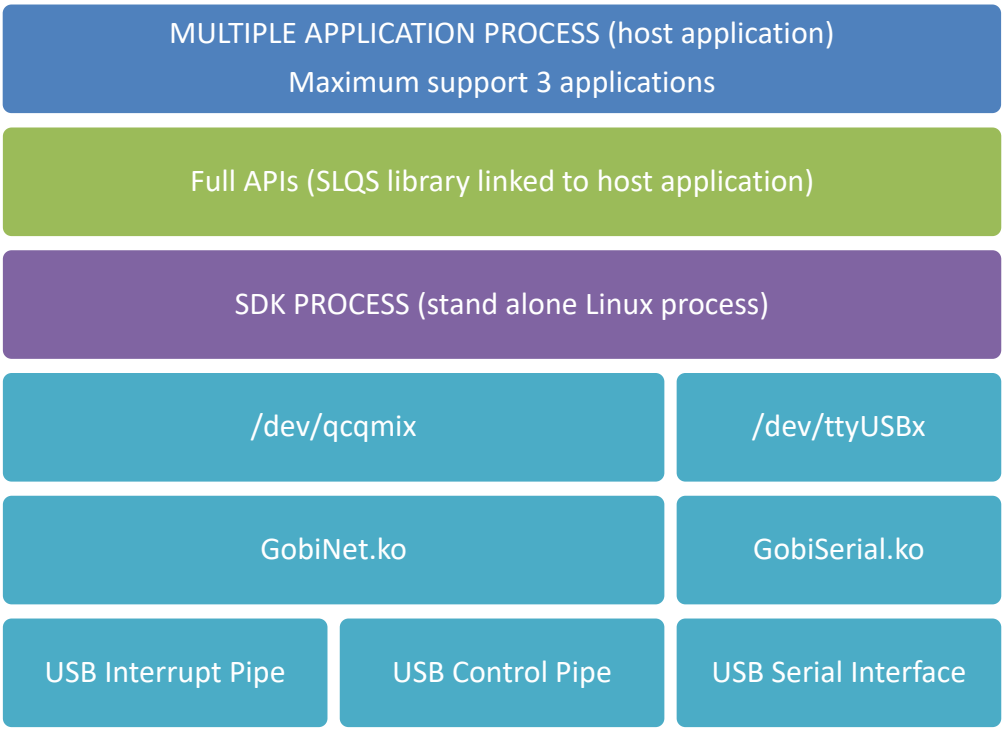


Figure 2. Full APIs System Architecture

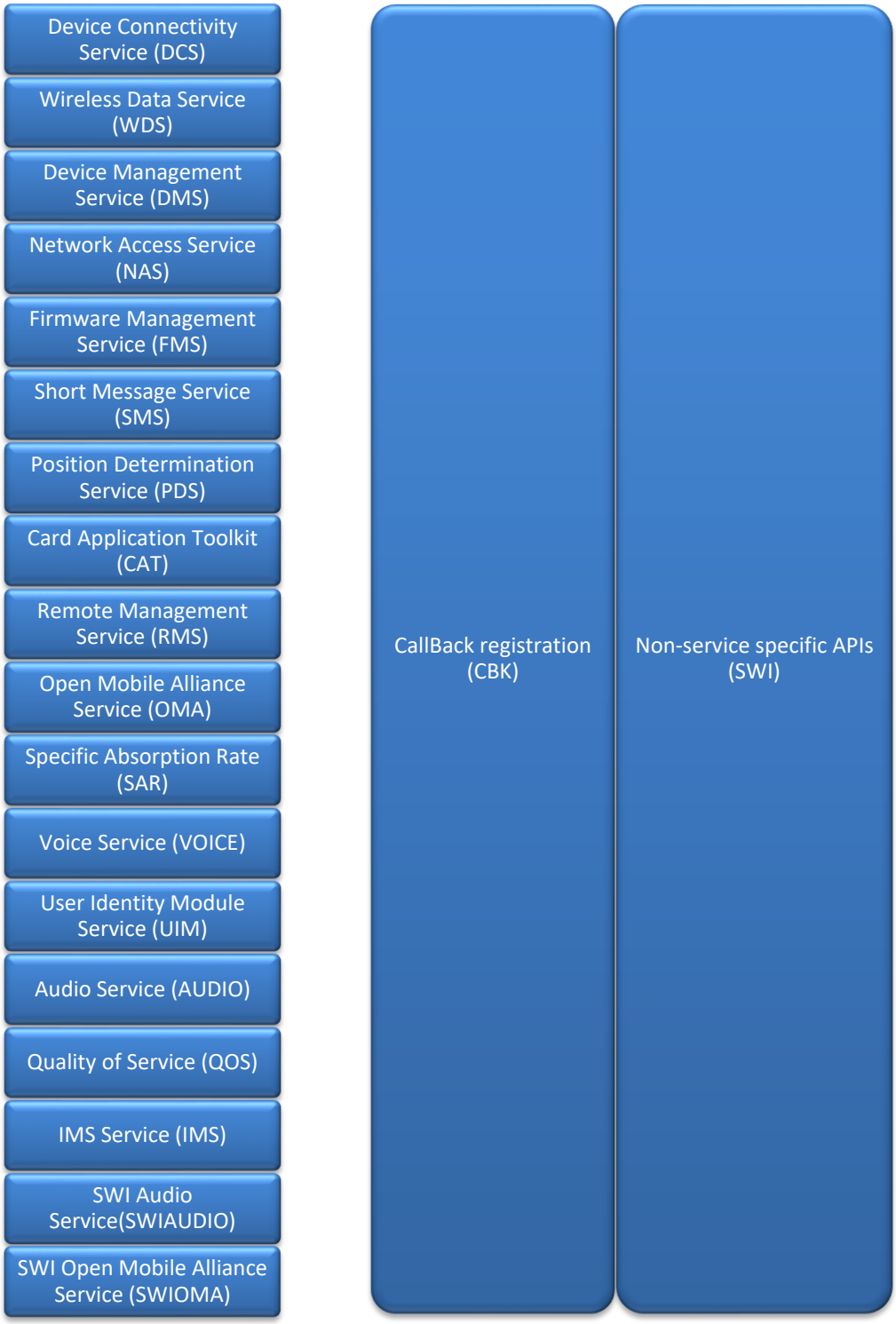


Figure 3. Full APIs Modules

The CBK service and SWI service provide services for all modules.

5. Full APIs Getting Started

5.1. QMI SDK Limitations

5.1.1. Multiple Application Processes Limitation

The SDK process can communicate with a maximum of 3 different host applications.

5.1.2. Multi-API Processing Within a Host Application

The SDK process can process only one QMI command at any point in time. Multiple calls made to the SDK will be serialized using a mutex.

The host application must make allowances for this behavior and ensure that the thread that holds the mutex will get a time slice to release the mutex.

5.2. Full APIs Callback that Auto Re-Register

- SetMobileIPStatusCallback
- SLQSSetWdsEventCallback
- SLQSSetWdsTransferStatisticCallback
- SLQSSetDUNCallInfoCallback
- SLQSSetDataSystemStatusCallback
- SetActivationStatusCallback
- SetPowerCallback
- SLQSSetModemTempCallback
- SetSignalStrengthCallback
- SetRFInfoCallback
- SLQSSetSignalStrengthsCallback
- SetLURejectCallback
- SLQSNasSysInfoCallBack
- SLQSNasNetworkTimeCallBack
- SetNMEACallback
- SetNewSMSCallback
- SLQSSetSMSEventCallback
- SLQSWmsMemoryFullCallBack
- SLQSWmsMessageWaitingCallBack
- SetCATEventCallback
- SetOMADMStateCallback
- SetSLQSOMADMAlertCallback
- SLQSVoiceSetSUPSNotificationCallback
- SLQSVoiceSetAllCallStatusCallBack
- SLQSVoiceSetPrivacyChangeCallBack
- SLQSVoiceSetDTMFEventCallBack
- SLQSVoiceSetSUPSCallBack
- SLQSUIMSetStatusChangeCallBack
- SLQSSetSIPConfigCallback
- SLQSSetRegMgrConfigCallback
- SLQSSetIMSSMSConfigCallback

- SLQSSetIMSUserConfigCallback
- SLQSSetIMSVoIPConfigCallback
- SetLocEventMaskNMEACallback
- SetLocGetServerCallback
- SetLocSetServerCallback
- SLQSSetUIMStatusCallback
- SLQSNasEdrxChangeInfoCallBack
- SetLocGetOpModeCallback
- SLQSSetWdsSwiProfileChangeCallback
- SLQSSetLocGetFixCriteriaCallback
- SLQSNasRFBandInfoCallback

5.3. User Application Development

5.3.1. SDK Process

5.3.1.1. Building the SDK Executable

```
navigate to pkgs:  cd pkgs
clean then build:  make –f pkgs.mak complete
clean:             make –f pkgs.mak clean
build:             make –f pkgs.mak
```

5.3.1.2. Verifying SDK and Target Platform Interoperability

The SDK periodically checks to see if a supported device is connected to the target platform. If you do not see the following message[1] in your logs, then the device has not been detected and the SDK will not be able to communicate with the device. In this case, it is most likely that you are either using an unsupported device or that your drivers need to be updated to support the device.

```
usb 2-1.5: new high speed USB device using ehci_hcd and address 10
usb 2-1.5: config 1 has an invalid interface number: 8 but max is 3
usb 2-1.5: config 1 has no interface number 1
usb 2-1.5: configuration #1 chosen from 1 choice GobiSerial 2-1.5:1.0:
GobiSerial converter detected
usb 2-1.5: GobiSerial converter now attached to ttyUSB0 GobiSerial 2-
1.5:1.2: GobiSerial converter detected
usb 2-1.5: GobiSerial converter now attached to ttyUSB1 GobiSerial 2-
1.5:1.3: GobiSerial converter detected
usb2-1.5: GobiSerial converter now attached to ttyUSB2
sb0: register 'GobiNet' at usb-0000:00:1d.0-1.5, QmiNet Ethernet
Device, 3e:a6:1f:b3:66:62
SWI SDK Process: USDT:Device State Change 0 -> 1
creating qcqmi0
USDT:Device State Change 1 -> 1
```

[1] SDK messages will be displayed in both /var/log/user.log and /var/log/syslog.

If you see the message above but do not see the following message in your logs, then the device's interfaces have not been successfully mapped to their respective /dev/ttyUSBx and/or /dev/qcqmix device special files and the SDK will not be able to communicate with the device.

- **USDT:Device State Change 1 -> 2**
- **USDT:Device ready: VID 1199, PID 68a2, 4 interfaces**
- **QM:qm_ds_handle_app_dev_ready: devstate 1**
- **QM:SDK<-Mdm: ch/QMImsgid/QMImsglen/IPCmsglen: 1/0000/0/25**
- **QM:DS Device Event Notification received 1**

In this case, it is possible that:

1. your drivers do not support the inserted device.
2. you have not added a device node for /dev/qcqmix (usually 0 or 1) with the proper major and minor numbers.
3. the interface configuration of your device is not supported by the SDK; or
4. the SDK's device scanning routine requires custom modifications specific to your platform's sysfs/sys/bus/usb/devices entry for the device in question. The major and minor numbers of the device can be determined by issuing **`ls -l /dev/qcqmix`** on the command line. The fourth and fifth columns contain the major and minor numbers, respectively (see **`man ls`** for details).

5.3.2. User Application Process

5.3.2.1. Building the Application Executable

Refer to any one of the sample applications' make files as a starting point for writing a script for building your application. Remember to add the "strip" command to your script to remove all symbol information from your libraries and application image if your system is memory constrained.

5.3.2.2. Communicating with the Device

The application must adhere to the SDK's stop and wait (synchronous execution) protocol; there can be only one outstanding transaction between the application and SDK, at any time. All API function calls are blocking and execute within the context of the application process. When the application executes API function, the corresponding request is constructed and sent to the SDK process over a local IPC. The request (response) is sent to (received from) the device from within the execution context of the SDK process. The response from the device is validated and sent back to the application process over a local IPC socket. After which, the message contents are unpacked and used for populating the user supplied arguments.

Notifications, on the other hand, are asynchronous and therefore, may arrive at any time. The application receives notifications within the execution context of a dedicated notification thread that is created and used by the SDK within the application's process. Thus, it is important that minimal processing be done inside the registered callback functions.

5.3.3. User Application Development

5.3.3.1. Multiple Module Management

Since SLQS03.03.00, Sierra Wireless has introduced multiple module management, also known as multi modem support. The SLQSStart is used to select which modem to control. Passing 0, 1 and 2 will select the first, second and third modem detected. It supports a maximum of 12 modems.

The qatest is already updated to support multiple modems as an example. There is a “-d” command line switch to specify modem index.

The following example controls the first and second modems.

```
sudo ./pkgs/qa/qatesthostx86_64 -r -d0
sudo ./pkgs/qa/qatesthostx86_64 -r -d1
```

5.3.3.2. Where to Start

The Connection Manager Sample Application is a good place to start. The source code is located at SampleApps/ Connection_Manager/src/connectionmgr.c.

The following outlines the recommended method for integrating SLQS initialization code into your application. Note that all variables below are assumed to have been defined.

```
/* Set the SDK executable path for your target platform */
    if( SUCCESS != (resultCode = SetSDKImagePath(sdkbinpath)) )
    {
        rcprint( __func__, resultCode );
        return resultCode;
    }

     /* Launch the SDK process and create IPC sockets over which the APP and SDK
      * will exchange messages.
      */
    if( SUCCESS != (resultCode = SLQSStart(modem_index)) )
    {
        /* first attempt failed, kill SDK process */
        if( SUCCESS != SLQSKillSDKProcess() )
        {
            return resultCode;
        }
        else
        {
            /* start new SDK process */
            if( SUCCESS != (resultCode = SLQSStart(modem_index)) )
            {
                return resultCode;
            }
```

```
        }
    }

    /* Enumerate the device */
    while (QCWWAN2kEnumerateDevices(&devicesSize, (BYTE *)pdev) != 0)
    {
        printf ("\nUnable to find device..\n");
        sleep(1);
    }

    #ifdef DBG
    fprintf( stderr,  "#devices: %d\ndeviceNode: %s\ndeviceKey: %s\n",
            devicesSize,
            pdev->deviceNode,
            pdev->deviceKey );
    #endif

    /* Connect to the SDK */
    resultCode = QCWWANConnect( pdev->deviceNode,
                                pdev->deviceKey );

    /* Subscribe to all the required callbacks */
    SubscribeCallbacks();

/* Graceful SLQS teardown */
void QuitApplication()
{
    free(sdkbinpath);
    fprintf( stderr, "Exiting Application!!!\n" );

    /* Unsubscribe all the callback which was called previously */
    UnSubscribeCallbacks();
    closeLogFile();

     /* If the application is connected to the SDK, then disconnect to (1)
      * terminate threads and free resources that have been created and allocated,
      * respectively, for communicating with the device, and (2) allow other
      * applications to communicate with the device via the SDK.
      */
  QCWWANDisconnect();
    exit( EXIT_SUCCESS );
}
```

```
/* macro used in code segments above */
#define rcprint(s, u) syslog(LOG_USER, "%s: rc = 0x%lX, %s", s, u, slqserrstr(u))

/* You can add error code to error string mapping to the table below in order to
 * aid your application debugging.
 */
typedef struct{
    enum eQCWWANError e;
    const char *es;
}slqserr_s;

static slqserr_s errstr[] =
{
    { eQCWWAN_ERR_INTERNAL,                    "eQCWWAN_ERR_INTERNAL" },
    { eQCWWAN_ERR_MEMORY,                      "eQCWWAN_ERR_MEMORY" },
    { eQCWWAN_ERR_INVALID_ARG,                 "eQCWWAN_ERR_INVALID_ARG" },
    { eQCWWAN_ERR_BUFFER_SZ,                   "eQCWWAN_ERR_BUFFER_SZ" },
    { eQCWWAN_ERR_NO_DEVICE,                   "eQCWWAN_ERR_NO_DEVICE" },
    { eQCWWAN_ERR_SWIDCS_IOCTL_ERR,            "eQCWWAN_ERR_SWIDCS_IOCTL_ERR" },
    { eQCWWAN_ERR_QMI_MISSING_ARG,             "eQCWWAN_ERR_QMI_MISSING_ARG" },
    { eQCWWAN_ERR_SWICM_SOCKET_IN_USE,         "eQCWWAN_ERR_SWICM_SOCKET_IN_USE" },
    { eQCWWAN_ERR_SWIDCS_DEVNODE_NOT_FOUND,    "eQCWWAN_ERR_SWIDCS_DEVNODE_NOT_FOUND" },
    { eQCWWAN_ERR_SWIDCS_IOCTL_ERR,            "eQCWWAN_ERR_SWIDCS_IOCTL_ERR" },
    { eQCWWAN_ERR_SWIDCS_APP_DISCONNECTED,     "eQCWWAN_ERR_SWIDCS_APP_DISCONNECTED" },
    { eQCWWAN_ERR_SWICM_QMI_SVC_NOT_SUPPORTED, "eQCWWAN_ERR_SWICM_QMI_SVC_NOT_SUPPORTED" },
    { 0, "" }
};

static const char *slqserrstr(ULONG er)
{
    int count = 0;
    while( errstr[count].e ){
        if( errstr[count].e == er )
        {
            return errstr[count].es;
        }
        count++;
    }
    return "";
}
```

5.3.3.3. QCWWANDisconnect API

When your application no longer needs to communicate with the device it should execute the QCWWANDisconnect API in order to:

1. free the resources allocated by the SDK for communicating with the device;
2. deregister from all but the device state change callback; and
3. allow other applications to use the services of the SDK. As long as the device is connected to the target and the SDK process is alive, an application can always reconnect at a later time.

5.3.3.4. Terminating the SDK Process

To terminate the SDK process, execute the SLQSKillSDKProcess API. Note that this API requires that the SDK image be named sIqssdk, as is the case for the images located in the build/bin sub-directories of the SDK release.

5.3.3.5. Device Resets

Assuming the application has registered for the device state change callback, it will be notified whenever a device is disconnected or detected. Following a device reset, once the device has been detected by the SDK, all the callback functions that the application had registered for will be re-registered by the SDK on the application's behalf. Thus, the application need not take any action on a device reset aside from managing itself.

5.3.4. UMTS, LTE, and CDMA Data Sessions

This section describes the APIs for configuring profiles for use in a data session call as well as starting and stopping data session calls. For API parameter details, refer to the doxygen documentation of the APIs.

5.3.4.1. Profile Configuration

Profiles must be set before a data call can be made. Some carriers fix the profiles that can be used on their network. Without the use of SDK APIs, profiles can be created or modified using AT commands. The SDK provides the following APIs for profile configuration:

- GetDefaultProfile
- SetDefaultProfile
- GetDefaultProfileLTE
- SetDefaultProfileLTE

The APIs above write and get the default profile to and from the device, respectively. The default profile will be the one used to establish a data session. The LTE version supports IPV6 in addition to IPV4.

The following APIs perform the same functionality as the APIs above, but allow a profile ID to be specified. Valid profile ID values are 1 to 16.

- SLQSGetProfile
- SLQSSetProfile

The following API deletes a configured profile stored on the device. The deletion of a profile does not affect profile index assignments.

- SLQSDeleteProfile

The following API is used to create a new profile with the specified parameters. Note that some firmware versions do not support the optional Profile ID parameter. In this case an error will be returned and the caller can subsequently create a profile by specifying a NULL pointer for the Profile ID parameter. The Profile ID pertaining to the newly created profile is returned in the response structure parameter.

- SLQSCreateProfile

This API is used to create a new profile with the specified parameters.

- SLQSModifyProfile

5.3.4.2. Session Initiation and Termination

The API, SLQSStartStopDataSession, will use the default profile set up as described above to make a data connection. Some networks may require authentication fields.

To start a data session after a device has been enumerated, the following API may be used. Note that technology should be changed for the appropriate network – UMTS or CDMA; and that the optional parameters below are left as NULL for simplicity. Some of the optional parameters are supplied by the user as preferred information. The network may not be able to assign the preferred values and assign other values instead. In that case, the SLQSGetRuntimeSettings API may be used to retrieve some of this information once a data session has been established. This API supports IPV4, IPV6, and IPV4V6 data sessions specified by ipfamily member of struct ssdatasession_params.

```
ULONG technology = 1; //3GPP
ULONG profile_idx = 1;
struct ssdatasession_params session;
session.action = 1; //start data session
session.pTechnology = &technology;
session.pProfileId3GPP = &profile_idx;
session.pProfileId3GPP2 = NULL;
session.ipfamily = 4; //IPv4
rc = SLQSStartStopDataSession( &session );
```

To terminate any currently active data session given the session pointer, the following API is used.

```
session.action = 0; //stop data session
rc = SLQSStartStopDataSession( &session );
```

5.4. SLQS Image Management

The Gobi Image Management and MC77xx Image Management sample applications can be used to:

1. Query information about the firmware stored on the device
2. Query information about firmware images stored on the host
3. Download firmware to the device

5.4.1. Firmware Upgrade Process

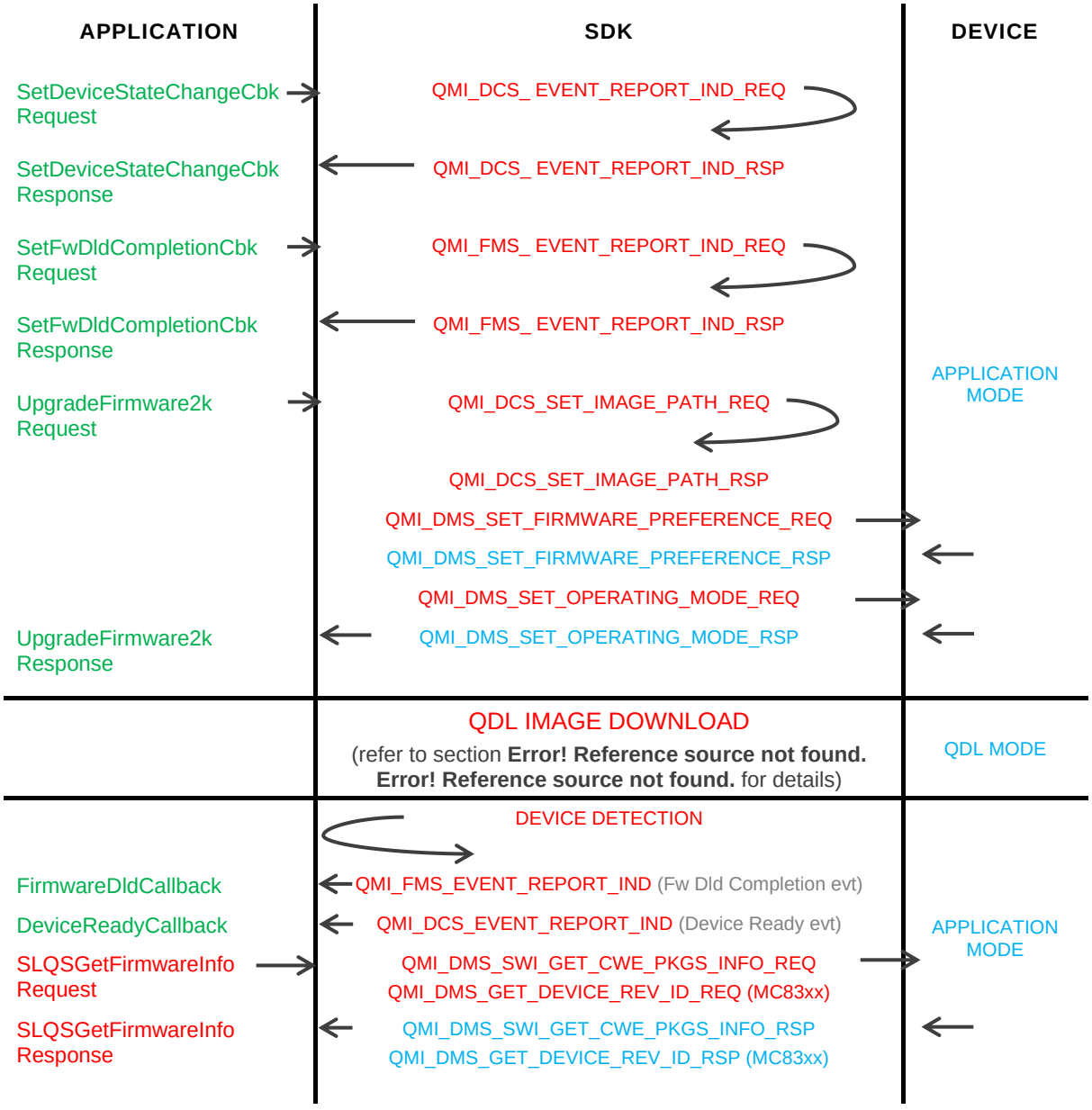


Figure 4. SLQS Image Management Sequence Diagram

Based on the figure above:

1. The Application may choose to register for a firmware download completion callback in order to be notified when the image download process has completed. Additionally, the application should register for the device state change callback in order to be notified of when the device has entered application mode subsequent to the image download, and is ready to communicate with the host.
2. To upgrade the firmware on the device, the application must issue the UpgradeFirmware2k API.
3. The Application should not issue any further API requests until the firmware download has completed and the device is ready.
4. Reception of the firmware download completion callback does not guarantee that the download process was successful. Once the device is ready, the application should issue the GetFirmwareRevisions API (for MC83xx devices) or the SLQSGetFirmwareInfo API (for MC77xx devices) to determine if the upgrade was successful.

5.4.2. QDL Image Download

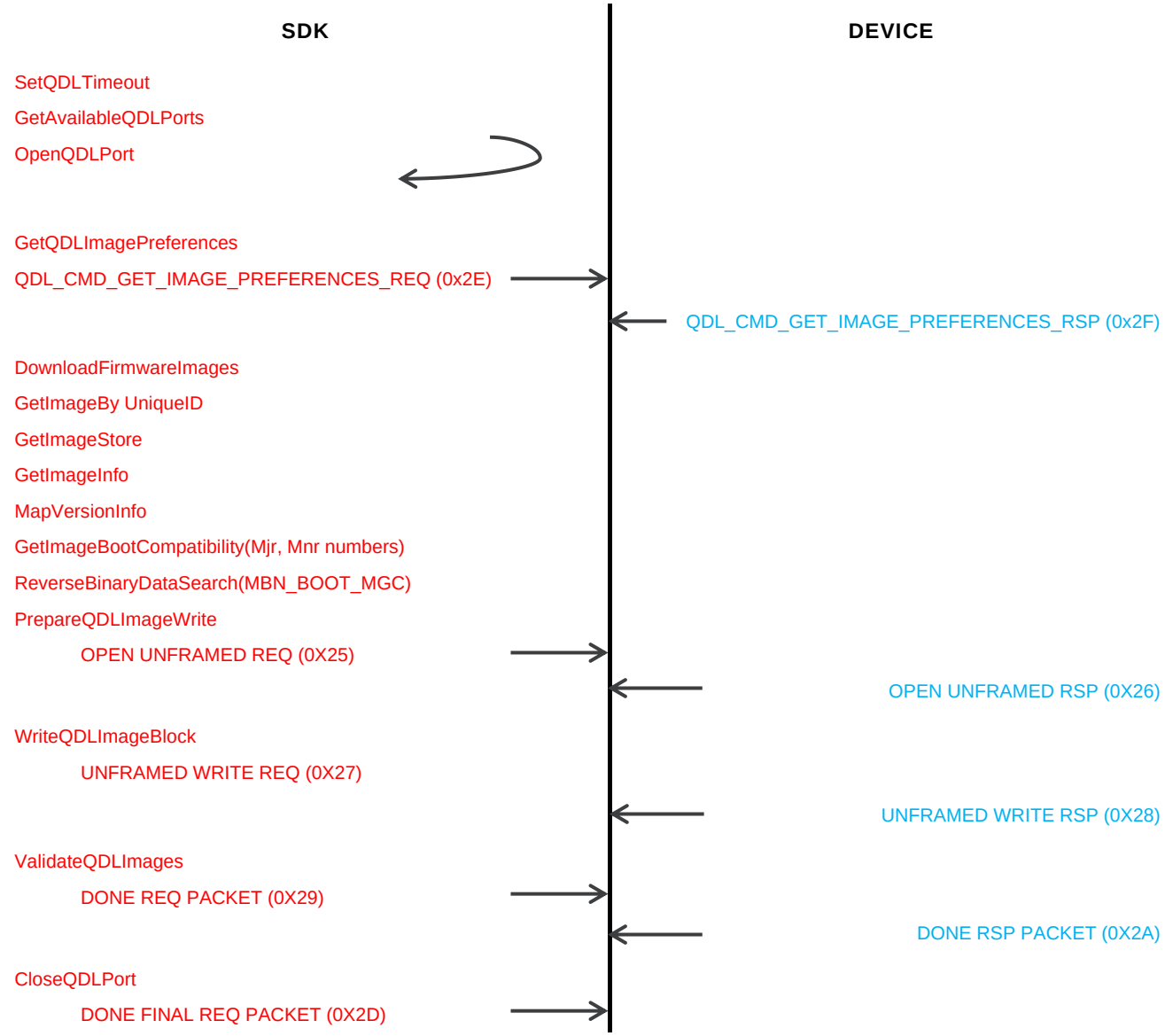


Figure 5. QDL Service Sequence Diagram

5.4.3. AR75xx, EM/MC7455, EM/MC7430, MC73xx, MC7700/10/50, WP76xx and RC76xx Modem Image Management

5.4.3.1. MC7xxx Image Management Sample Application

Location: SampleApps/MC77xx_Image_Management/

Purpose: Query image information for a MC7xx image located on the host
Query image information for the image running on a MC77xx device
Download firmware to a MC77xx device

Build:

i686:	make
ARM:	make CPU=arm9
Power PC:	make CPU=ppc
MIPS BE:	make CPU=mips
MIPS LE:	make CPU=mipsel

Execute:

i686:	sudo ./bin/mc7ximgmgmthosti686 ../../build/bin/hosti686/slqssdk
ARM:	sudo ./bin/mc7ximgmgmtarm9 ../../build/bin/arm/slqssdk
PPC:	sudo ./bin/mc7ximgmgmtppc ../../build/bin/ppc/slqssdk
MIPS BE:	sudo ./bin/mc7ximgmgmtmips ../../build/bin/mips/slqssdk
MIPS LE:	sudo ./bin/mc7ximgmgmtmipsel ../../build/bin/mipsel/slqssdk

Reference: SampleApps/MC77xx_Image_Management/readme.txt

The only supported file is a *_SPKG.cwe file.

The program must be executed from the SampleApps/MC77xx_Image_Management directory with the instructed execute command above.

There must only be one *.cwe or *.spk file in the path specified for any option which requires the user to specify a path.

If errors are encountered when specifying a relative path, specify the fully qualified path instead. For more details, refer to the readme.txt file

5.4.4. MC83xx, MC9090 and SL9090 Image Management

5.4.4.1. Gobi Image Management Sample Application

Location: SLQSab.cd.ef /SampleApps/Gobi_Image_Management/

Purpose: Query carrier image information for Gobi images located on the host
Query carrier image information for the images stored on a device
Download firmware to a device

Build:

i686:	make
ARM:	make CPU=arm9
Power PC:	make CPU=ppc
MIPS BE:	make CPU=mips
MIPS LE:	make CPU=mipsel

Execute:

i686:	sudo ./bin/gobiimgmgmthosti686 ../../build/bin/hosti686/slqssdk
ARM:	sudo ./bin/gobiimgmgmtarm9 ../../build/bin/arm/slqssdk
PPC:	sudo ./bin/gobiimgmgmtppc ../../build/bin/ppc/slqssdk
MIPS BE:	sudo ./bin/gobiimgmgmtmips ../../build/bin/mips/slqssdk
MIPS LE:	sudo ./bin/gobiimgmgmtmipsel ../../build/bin/mipsel/slqssdk

Reference: SLQSab.cd.ef /SampleApps/Gobi_Image_Management/readme.txt

The only supported file types are *.mbn files.

The program must be executed from the SampleApps/Gobi_Image_Management directory with the instructed execute command above.

If errors are encountered when specifying a relative path, specify the fully qualified path instead. For more details, refer to the readme.txt file.

5.4.5. One Command Line Firmware Downloader Sample Application

We recommend customers using lite-fw-download application to perform firmware download. Please refer to section 6.6 for more details.

Location: SLQSab.cd.ef /SampleApps/Firmware_Download/

Purpose: Perform a firmware download for the supported module by one command line.

Build:

i686:	make
ARM:	make CPU=arm9
Power PC:	make CPU=ppc
MIPS BE:	make CPU=mips
MIPS LE:	make CPU=mipsel

Execute:

i686: sudo ./bin/fwdldhosti686 -s ../../build/bin/hosti686/slqssdk -d [9x00/9x15/g3k/9x30/9x07/9x50/9x06] -p [pathname] -i 1

ARM: sudo ./bin/fwdldhostarm -s ../../build/bin/arm/slqssdk -d [9x00/9x15/g3k/9x30/9x07/9x50/9x06] -p [pathname] -i 1

PPC: sudo ./bin/fwdldppc -s ../../build/bin/ppc/slqssdk -d [9x00/9x15/g3k/9x30/9x07/9x50/9x06] -p [pathname] -i 1

MIPS BE: sudo ./bin/fwdldmips -s ../../build/bin/mips/slqssdk -d [9x00/9x15/g3k/9x30/9x07/9x50/9x06] -p [pathname] -i 1

MIPS LE: sudo ./bin/fwdldmipsel -s ../../build/bin/mipsel/slqssdk -d [9x00/9x15/g3k/9x30/9x07/9x50/9x06] -p [pathname] -i 1

Please note that the command highlighted in red above depends on the module you are trying to perform firmware download on. For example, if it is an MDM9x15 module such as AR7554, MC7304, MC7355 etc. you have to specify the device with –d 9x15, then the path (folder of firmware images) such as –p /tmp/firmware/AR7554.

Inside the firmware folder /tmp/firmware/AR7554, there should be two files: one is a .nvu file of the firmware version. The other one can be a firmware file either with a .cwe or .spk file extension.

Taking the AR7554 as an example, the whole procedure should be as enumerated below:

1. Prepare the firmware files (.nvu + .cwe or .spk) for the update, for example, by creating a folder /tmp/firmware/AR7554.

   tester@Ubuntu12.04:/tmp/firmware/AR7554$ ls

   1101831_9902428_SWI9X15A_06.00.01.00_00_GENEU_006.000_000-field.spk

   NVUP-9999999_9902428_GENEU-4G_006.000_000.nvu

   cd SampleApps/Firmware_Download

2. Type command “sudo ./bin/fwdldhosti686 -s ../../build/bin/hosti686/slqssdk -d 9x15 -p /tmp/firmware/AR7554 – i 1”

3. Once the firmware download starts, the console log should look like the following:

tester@Ubuntu12.04:~/projects/Linux_QMI_SDK/tags/SLQS03.02.03/SampleApps/Firmware_Download$ sudo ./bin/fwdldhosti686 -s ../../build/bin/hosti686/slqssdk -d 9x15 -p /tmp/firmware/AR7554 – i 1

Detecting USB of the target

DONE

Communicating with the target

DONE

Switching to firmware download mode

.....DONE

Downloading the firmware

..DONE

Rebooting the module

.....DONE

Firmware Download SUCCESS

WP76xx, WP77xx, RC76xx and EM75xx modules use Firehose firmware download protocol, the SDK process will select a correct protocol to perform firmware download, user only need to input correct module family.

For more details on the usage of this Firmware_Download sample application, please read the readme.txt file under the same directory SampleApps/Firmware_Download.

Also, note that:

- The only supported file types are *.nvu, *.cwe and *.spk files.
- The program must be executed from the SampleApps/Firmware_Download/ directory

5.4.6. EM/MC7430 and EM/MC7455 Device based image switching

The MC7xxx_Image_Switching sample application supports device-based image switching on EM/MC7455 and EM/MC730. Below example switch from Verizon to ATT without host downloading firmware to modem. The device image & host image have Storage Type of 0 and 1, respectively.

```
7. Image Switching on MC/EM74xx
Option: 7


Please specify the path (upto 510 Characters) or press <Enter> to return to the main menu:
/tmp/invalid


Current Firmware info
---------------------
Model ID: EM7455
BOOT Version: SWI9X30C_01.08.07.00
AMSS Version: SWI9X30C_01.08.07.00
SKU ID: 9101012
Package ID:
Carrier: 5
PRI version: 001.000


All Carrier Images on Host and Device
-------------------------------------
Index   CarrierId   FolderId   Storage Type   PriImageId     PriBuildId              FwImageId
FwBuildId
1       4           2          0              001.007_000    01.09.06.00_ATT         ?_?
01.09.06.00_?
2       5           1          0              000.004_000    01.08.07.00_VERIZON     ?_?
01.08.07.00_?


Please select from one of the above index or press <Enter> to return to main menu:
Option: 1


Do you want to switch the firmware of your choice (Y/N):
Option: y



Downloading
Firmware.....................................................................
No Firmware download needed!
Applying SPKG updates - please wait 20 seconds...
```

You can verify the switching with “AT!PRIID?”

Before image switching Active image

```
ati
Manufacturer: Sierra Wireless, Incorporated
Model: EM7455
Revision: SWI9X30C_01.08.07.00 r3743 CARMD-EV-FRMWR2 2015/08/13 23:07:36
ESN: 11601589393, 74184091
IMEI: 359073060004045
IMEI SV:  1
FSN: LF504300170302
+GCAP: +CGSM

OK
at!priid?
PRI Part Number: 5501012
Revision: 001.000
Customer: DevKit

Carrier PRI: 9999999_9904780_SWI9X30C_01.08.07.00_00_VERIZON_000.004_000
```

After Image switching active image

```
ati
Manufacturer: Sierra Wireless, Incorporated
Model: EM7455
Revision: SWI9X30C_01.09.06.00 r4004 CARMD-EV-FRMWR2 2015/09/01 20:44:43
ESN: 11601589393, 74184091
IMEI: 359073060004045
IMEI SV:  2
FSN: LF504300170302
+GCAP: +CGSM

OK
at!priid?
PRI Part Number: 5501012
Revision: 001.000
Customer: DevKit

Carrier PRI: 9999999_9904594_SWI9X30C_01.09.06.00_00_ATT_001.007_000
```

Inside the sample application, the API UpgradeFirmware2K is used to switch image within device.

```
tree /tmp/swisscom
/tmp/swisscom
+-- 16
   +-- SWI9X30C_01.08.07.00.cwe
   +-- SWI9X30C_01.08.07.00_SWISSCOM_001.007_000.nvu


All Carrier Images on Host and Device
-------------------------------------
Index   CarrierId   FolderId   Storage Type   PriImageId     PriBuildId
FwImageId     FwBuildId
1       210         16         1              001.007_000    01.08.07.00_SWISSCOM    ?_?
01.08.07.00_?
2       4           2          0              001.007_000    01.09.06.00_ATT         ?_?
01.09.06.00_?
3       5           1          0              000.004_000    01.08.07.00_VERIZON     ?_?
01.08.07.00_?
```

When the path input to UpgradeFirmware2K is invalid, the inner most folder name will be parsed as image slot index.

UpgradeFirmware2K input path	Device/Host Image	Carrier
/tmp/Swisscom/16	Host Image	Swisscom
/tmp/Swisscom/2	Device Image	ATT
/tmp/Swisscom/1	Device Image	Verizon

The API to list device & host images is SLQSSwiGetAllCarrierImages

5.5. Other Sample Applications

Information for Call Handling, Connection Manager, SMS, and Developer Tutorial sample applications are provided in the following sub-sections.

5.5.1. Call Handling Sample Application

Location: SampleApps/CallHandling_Application/

Purpose: Voice call testing includes dialing, answering and ending a call.

Build:

i386:	make
ARM:	make CPU=arm9
Power PC:	make CPU=ppc
MIPS BE:	make CPU=mips
MIPS LE:	make CPU=mipsel

Execute:

i386:	sudo ./callhandlinghosti386
ARM:	sudo ./callhandlinghostarm9
PPC:	sudo ./callhandlinghostppc
MIPS BE:	sudo ./callhandlinghostmips
MIPS LE:	sudo ./callhandlingmipsel

Reference: SampleApps/CallHandling_Application/readme.txt

5.5.2. Connection Manager Sample Application

Location: SampleApps/Connection_Manager/

Purpose: Starting and stopping data session for LTE, UMTS & CDMA

Build:

i386:	make
ARM:	make CPU=arm9
Power PC:	make CPU=ppc
MIPS BE:	make CPU=mips
MIPS LE:	make CPU=mipsel

Execute:

i386:	sudo ./connectionmanagerhosti386
ARM:	sudo ./ connectionmanagerhostarm9
PPC:	sudo ./ connectionmanagerhostppc
MIPS BE:	sudo ./ connectionmanagerhostmips
MIPS LE:	sudo ./ connectionmanagerhostmipsel

Reference: SampleApps/Connection_Manager/readme.txt

5.5.3. SMS Sample Application

Location: SampleApps/Gobi_Image_Management/

Purpose: Send, read, and delete SMS messages

Build:

i386:	make
ARM:	make CPU=arm9
Power PC:	make CPU=ppc
MIPS BE:	make CPU=mips
MIPS LE:	make CPU=mipsel

Execute:

i386:	sudo ./SMSSampleAppi386
ARM:	sudo ./SMSSampleApparm9
PPC:	sudo ./SMSSampleAppppc
MIPS BE:	sudo ./SMSSampleAppmips
MIPS LE:	sudo ./SMSSampleAppmipsel

Reference: SampleApps/SMSSampleApp/readme.txt

5.5.4. SLQS Tutorial Sample Application

Location: SampleApps/SLQS_Tutorial/

Purpose: Familiarize Application Developers with the SDK and provide a starting point for writing an application.

Build: i386: make
ARM: make CPU=arm9
Power PC: make CPU=ppc
MIPS BE: make CPU=mips
MIPS LE: make CPU=mipsel

Execute: i386: sudo ./slqstutoriali386
ARM: sudo ./slqstutorialarm9
PPC: sudo ./slqstutorialppc
MIPS BE: sudo ./slqstutorialmips
MIPS LE: sudo ./slqstutorialmipsel

5.5.4.1. Using the SLQS Tutorial

Open two terminals, one for running the application, the other for viewing the message log.

In the message log terminal execute **`tailf /var/log/syslog | grep slqstuotrial`**.

In the application terminal execute **`sudo ./slqstutorial`**.

Two example sessions are shown below with interleaved explanations. Messages in green were echoed to /var/log/syslog from a third terminal to explain what is being done.

5.5.4.1.1. Execution with Root Privileges

```
slqstutorial: Run the Application ( sudo ./slqstutorial )
slqstutorial: cigetnumappclients: count: 1
slqstutorial: wSLQSStart: APP<->SDK IPC init successful
slqstutorial: wSLQSStart: APP registered for Device State Change notification
The application has set the SDK image path, registered for the device state change
callback, and started the SDK i.e. called SLQSStart which creates the SDK process
and local IPC sockets.
slqstutorial: Physically Remove the Device
slqstutorial: Device State Change Callback Invoked: rc = 0x0,
slqstutorial: appstatechange: device disconnected, APP disconnected from SDK
slqstutorial: appstatechange: device ready, APP disconnected from SDK
slqstutorial: appstatechange: device ready, APP connected to SDK
The two messages above illustrate that the application will continue to receive
device state change notifications even after calling the QCWWANDisconnect API.
slqstutorial: Attempt to Enumerate the device while it is absent ( Option 1 )
```

```
slqstutorial: wQCWWANEnumerateDevices: rc = 0x6, eQCWWAN_ERR_NO_DEVICE
slqstutorial: #devices: 1 deviceNode:  deviceKey:
slqstutorial: wQCWWANConnect: rc = 0x6, eQCWWAN_ERR_NO_DEVICE
Device enumeration has failed as the SDK did not detect a device
slqstutorial: Physically plug in the device
slqstutorial: Device State Change Callback Invoked: rc = 0x1,
slqstutorial: appstatechange: device ready, APP disconnected from SDK
The application is notified of the device state change
slqstutorial: Attempt to Enumerate the device ( Option 1 )
slqstutorial: Enumerate, Connect, Connect/Disconnect device
slqstutorial: wQCWWANEnumerateDevices: rc = 0x0,
slqstutorial: #devices: 1 deviceNode: /dev/qcqmi0 deviceKey: 00000000000000
slqstutorial: appstatechange: device ready, APP disconnected from SDK
Device enumeration is successful but note that the application is still not bound
to the SDK (APP disconnected from SDK.
slqstutorial: Attempt to Connect to the enumerated device  ( Option 2 )
slqstutorial: wQCWWANConnect: rc – 0x0
slqstutorial: appstatechange: device ready, APP connected to SDK
The application is now bound to the SDK (APP connected to SDK)and may therefore
issue any API function hereon.
slqstutorial: Physically remove the device while the application is bound to the
SDK
slqstutorial: Device State Change Callback Invoked: rc = 0x0,
slqstutorial: appstatechange: device disconnected, APP connected to SDK
The application is notified of the device state change
slqstutorial: Plug in the device while the application is still bound to the SDK
slqstutorial: Device State Change Callback Invoked: rc = 0x1,
slqstutorial: appstatechange: device ready, APP connected to SDK
The application is notified of the device state change
slqstutorial: Execute some APIs to confirm that the application is still bound to
the SDK
slqstutorial: wGetSessionState: rc = 0x0, ( Option 5 )
slqstutorial: wStartDataSession: rc = 0x0,     ( Option 6 )
slqstutorial: wStopDataSession: rc = 0x0,      ( Option 7 )
Successful execution of APIs as indicated by a return code of 0x0
slqstutorial: Kill the SDK Process ( option 10 )
slqstutorial: wSLQSKillSDKProcess: rx = 0x0,
SDK process has been terminated (issue ps -eT | grep slqs to confirm the process is
no longer running)
slqstutorial: Restart the SDK process ( option 0 )
slqstutorial: Device State Change Callback Invoked: rc = 0x1,
slqstutorial: appstatechange: device ready, APP diconnected from SDK
The application has set the SDK image path, registered for the device state change
callback, and started the SDK i.e. called SLQSStart which creates the SDK process
and local IPC sockets.
```

slqstutorial: Exit the application (option 11)

slqstutorial: cleanup: Good bye! (0x0)

5.5.4.1.2. Execution without Root Privileges

Note that there must not be an SDK daemon running with root priveleges or you will not see the same behaviour as described for below. Issue **sudo killall slqssdk** to make sure this is the case.

slqstutorial: Run the application w/o root priveleges

slqstutorial: cigetnumappclients: count: 1

slqstutorial: wSLQSStart: APP<->SDK IPC init successful

slqstutorial: wSLQSStart: APP registered for Device State Change notification

slqstutorial: wSLQSStart: APP<->SDK IPC init successful

slqstutorial: wSLQSStart: APP registered for Device State Change notification

The application has set the SDK image path, registered for the device state change callback, and started the SDK i.e. called SLQSStart which creates the SDK process and local IPC sockets.

slqstutorial: Attempt to Enumerate the device (Option 1)

slqstutorial: wQCWWANEnumerateDevices: rc = 0xE901, eQCWWAN_ERR_SWIDCS_IOCTL_ERR

Notice that an error is returned because anyone trying to access the /dev/qcqmix device special file must have root priveleges.

slqstutorial: #devices: 1 deviceNode: deviceKey:

Since the IOCTL issued by the SDK to the driver fails, the device key is not returned and the returned values are blank.

slqstutorial: Attempt to Connect to the non-enumerated device (Option 2)

slqstutorial: wQCWWANConnect: rc = 0x6, eQCWWAN_ERR_NO_DEVICE

No device has been enumerated as indicated by the error above

slqstutorial: Attempt to execute other APIs

slqstutorial: wQCWWANGetConnectedDevice: rc = 0x6, eQCWWAN_ERR_NO_DEVICE
(Option 4)

slqstutorial: wGetSessionState: rc = 0xE903, eQCWWAN_ERR_SWIDCS_APP_DISCONNECTED
(Option 5)

slqstutorial: wStartDataSession: rc = 0xE903, eQCWWAN_ERR_SWIDCS_APP_DISCONNECTED
(Option 6)

slqstutorial: wStopDataSession: rc = 0xE903, eQCWWAN_ERR_SWIDCS_APP_DISCONNECTED
(Option 7)

The application is not bound to the SDK and errors are received as shown above

5.5.5. Connection Manager Sample Application

Location: SampleApps/Connection_Manager/

Purpose: Create, delete, view, and modify profiles. Start/stop data sessions.

Build:

i386:	make
ARM:	make CPU=arm9
Power PC:	make CPU=ppc
MIPS BE:	make CPU=mips
MIPS LE:	make CPU=mipsel

Execute:

i386:	sudo ./connectionmgri386
ARM:	sudo ./connectionmgrarm9
PPC:	sudo ./connectionmgrppc
MIPS:	sudo ./connectionmgrmips
MIPS BE:	sudo ./connectionmgrmipsel

5.5.6. Position Determination Service Sample Application

Location: SampleApps/PDS_Service/

Purpose: Set and Get GPS Service State. Start/stop tracking session.

Build:

i386:	make
ARM:	make CPU=arm9
Power PC:	make CPU=ppc
MIPS BE:	make CPU=mips
MIPS LE:	make CPU=mipsel

Execute:

i386:	sudo ./pdsservicehosti386
ARM:	sudo ./pdsservicearm9
PPC:	sudo ./pdsserviceppc
MIPS:	sudo ./pdsservicemips
MIPS BE:	sudo ./pdsservicemipsel

5.5.7. SWIOMA Sample Application

Location: SampleApps/SWIOMA_Application/

Purpose: Set and Get SWIOMADM setting. Start/cancel SWIOMADM session.

Build:

i386:	make
ARM:	make CPU=arm9
Power PC:	make CPU=ppc
MIPS BE:	make CPU=mips
MIPS LE:	make CPU=mipsel

Execute:

i386:	sudo ./SWIOMASampleApphosti386
ARM:	sudo ./SWIOMASampleApparm9
PPC:	sudo ./SWIOMASampleAppppc
MIPS:	sudo ./SWIOMASampleAppmips
MIPS BE:	sudo ./SWIOMASampleAppmipsel

5.6. AirVantage Agent Integration

The AirVantage agent was fully integrated to SLQS starting from version 3.2. It is a default service running in the background when SLQS starts. Users do not need to explicitly start the service.

To disable the service, the user needs to properly setup SLQS through a configuration file. SLQS will not start if AirVantage service is missing or not properly setup.

5.6.1. Auto Start Preprocessor

AGENT_AUTO_START is by default disabled at pkgs/slqscompile.mak. To enable, uncomment command line: **`CFLAGS += -DAGENT_AUTO_START`**.

5.6.2. Agent Configuration File

Location: Same directory of slqssdk

Name: . sdk_config

Syntax: AVA_PATH=absolute path of runtime folder of agent

e.g. AVA_PATH=/home/ SDK/AirVantageAgent/build.arm/runtime

To disable the agent, set **`AVA_PATH=NO_AVA`** (only first line of config file will be read)

If the configuration file is missing, SLQS will try to search for “AirVantageAgent/runtime” in the slqssdk folder. If it is still not found, SDK will not start.

5.6.3. Agent Constrains

SLQS supports a maximum of three simultaneous applications and AirVantage service uses two of them. Only one extra application is supported when AirVantage is started.

5.6.4. Agent Source Tree

Location:	SampleApps/AirVantageAgent/avagent_r8m	
Build:	i386:	build_avagent.sh
	arm:	build_avagent.sh arm
Output:	i386:	build.default
	arm:	build.arm

5.6.5. Start/Stop the AirVantage Agent

To start, run “start_sdk_hosti686.sh” or start any sample application.

To stop, run “stop_sdk_hosti686.sh”.

5.6.6. AirVantage M2M Cloud

Address: http://eu.airvantage.net/

5.7. Full APIs Debug Information

When the SDK is compiled with DEBUG_IPC_MSG_FLAG defined, additional logs will be captured in syslogs. These logs will print useful information like if a REQ/RESP/NOTIF is sent/received and prints svc and msg id for that transaction at the following points of code flow:

```
1. When request sent from API process to SDK process
Eg:[swi_osapiipcwrite] REQ svc 3 msgid 0x2

2. When request received by SDK process
Eg:[amipcrcvhandler] REQ svc 3 msgid 0x2

3. When response sent from SDK process to API process
Eg:[swi_ossdkipcwrite] RESP svc 3 msgid 0x2

4. When response received by API process
Eg:[amsendnwait] RESP svc 3 msgid 0x2

5. When notification sent from SDK process to API process
Eg:[amapiwaitnotif] NOTIF svc 3 msgid 0x2

6. When notification received by API process
Eg:[swi_osapiipcread] NOTIF svc 3 msgid 0x2

7. A log when a mutex is obtained and released by the API process
Eg:[amgetreqbufp] Mutex Locked
[amrelreqbufp] Mutex Unlocked

8. A log with the timeout value for a particular API
Eg:[SwiQmiMISendnWait]Timeout 2000 seconds
```

For Example:

Sep 8 13:49:29 infy-desktop qatesthostx86_64: SetSignalStrengthCallback - START

Sep 8 13:49:29 infy-desktop qatesthostx86_64: [amgetreqbufp] Mutex Locked

Sep 8 13:49:29 infy-desktop qatesthostx86_64: [SwiQmiMISendnWait]Timeout 2000 seconds

Sep 8 13:49:29 infy-desktop qatesthostx86_64: [swi_osapiipcwrite] REQ svc 3 msgid 0x2

Sep 8 13:49:29 infy-desktop qatesthostx86_64: [swi_osapiipcread] NOTIF svc 0 msgid 0x0

Sep 8 13:49:29 infy-desktop SWI0 SDK Process: [amipcrcvhandler] REQ svc 3 msgid 0x2

Sep 8 13:49:29 infy-desktop SWI0 SDK Process: [swi_ossdkipcread] NOTIF svc 0 msgid 0x0

Sep 8 13:49:29 infy-desktop SWI0 SDK Process: QM:qmqmireq/1390: Request: QMI Instance 0

Sep 8 13:49:29 infy-desktop SWI0 SDK Process: QM:SDK->Mdm: request received : ipcch/svctype/xactionlen/clientnum: 0/0003/14/2

Sep 8 13:49:29 infy-desktop SWI0 SDK Process: QM:SDK->Mdm: request validated : ipcch/svctype/xactionlen/clientnum: 0/0003/14/2

Sep 8 13:49:29 infy-desktop SWI0 SDK Process: QM:Launching QMI DS shell: service 3(NAS)

Sep 8 13:49:29 infy-desktop SWI0 SDK Process: QM:qmqmireq/1501: WDS Request: Active Client 2, WDS Client 0

Sep 8 13:49:29 infy-desktop SWI0 SDK Process: UDIAG:DS Shell launched

Sep 8 13:49:29 infy-desktop SWI0 SDK Process: QMURR1:Endpoint DS shell instance created

Sep 8 13:49:29 infy-desktop SWI0 SDK Process: USB read: bytes2read = 14, read 14 bytes

Sep 8 13:49:29 infy-desktop SWI0 SDK Process: QM:SDK<-Mdm Resp: ch/Msgid/Msglen/IPCmsglen: 0/0002/11/29

Sep 8 13:49:29 infy-desktop SWI0 SDK Process: [swi_ossdkipcwrite] RESP svc 3 msgid 0x2

Sep 8 13:49:29 infy-desktop qatesthostx86_64: [amsendnwait] RESP svc 3 msgid 0x2

Sep 8 13:49:29 infy-desktop qatesthostx86_64: [amrelreqbufp] Mutex Unlocked

Sep 8 13:49:29 infy-desktop qatesthostx86_64: SetSignalStrengthCallback - END

Sep 8 13:52:00 infy-desktop SWI0 SDK Process: USB read: bytes2read = 12, read 12 bytes

Sep 8 13:52:00 infy-desktop SWI0 SDK Process: QM:SDK<-Mdm Notif: ch/Msgid/Msglen/IPCmsglen: 1/0002/9/27

Sep 8 13:52:00 infy-desktop SWI0 SDK Process: [swi_ossdkipcwrite] NOTIF svc 3 msgid 0x2

Sep 8 13:52:00 infy-desktop SWI0 SDK Process: QM:SDK<-Mdm Notif: ch/Msgid/Msglen/IPCmsglen: 3/0002/9/27

Sep 8 13:52:00 infy-desktop kernel: [869620.269915] GobiNet::UpSem 0x0103

Sep 8 13:52:00 infy-desktop kernel: [869620.270156] GobiNet::FindClientMem Found client's 0x103 memory

Sep 8 13:52:00 infy-desktop SWI0 SDK Process: QM:SDK<-Mdm Notif: ch/Msgid/Msglen/IPCmsglen: 5/0002/9/27

Sep 8 13:52:00 infy-desktop qatesthostx86_64: [amapiwaitnotif] NOTIF svc 3 msgid 0x2

Sep 8 13:52:00 infy-desktop qatesthostx86_64: [swi_osapiipcread] NOTIF svc 3 msgid 0x2

Sep 8 13:52:03 infy-desktop SWI0 SDK Process: QM:SDK<-Mdm Notif: ch/Msgid/Msglen/IPCmsglen: 1/0002/9/27

Sep 8 13:52:03 infy-desktop SWI0 SDK Process: [swi_ossdkipcwrite] NOTIF svc 3 msgid 0x2

Sep 8 13:52:03 infy-desktop SWI0 SDK Process: QM:SDK<-Mdm Notif: ch/Msgid/Msglen/IPCmsglen: 3/0002/9/27

Sep 8 13:52:03 infy-desktop SWI0 SDK Process: QM:SDK<-Mdm Notif: ch/Msgid/Msglen/IPCmsglen: 5/0002/9/27

Sep 8 13:52:03 infy-desktop qatesthostx86_64: [amapiwaitnotif] NOTIF svc 3 msgid 0x2

Sep 8 13:52:03 infy-desktop qatesthostx86_64: [swi_osapiipcread] NOTIF svc 3 msgid 0x2

Sep 8 13:52:04 infy-desktop SWI0 SDK Process: USB read: bytes2read = 45, read 45 bytes

Sep 8 13:52:04 infy-desktop SWI0 SDK Process: QM:SDK<-Mdm Notif: ch/Msgid/Msglen/IPCmsglen: 1/0024/42/60

Sep 8 13:52:04 infy-desktop SWI0 SDK Process: [swi_ossdkipcwrite] NOTIF svc 3 msgid 0x36

Sep 8 13:52:04 infy-desktop SWI0 SDK Process: QM:SDK<-Mdm Notif: ch/Msgid/Msglen/IPCmsglen: 3/0024/42/60

Sep 8 13:52:04 infy-desktop SWI0 SDK Process: QM:SDK<-Mdm Notif: ch/Msgid/Msglen/IPCmsglen: 5/0024/42/60

Sep 8 13:52:04 infy-desktop qatesthostx86_64: [amapiwaitnotif] NOTIF svc 3 msgid 0x36

Sep 8 13:52:04 infy-desktop qatesthostx86_64: [swi_osapiipcread] NOTIF svc 3 msgid 0x36

Sep 8 13:52:04 infy-desktop SWI0 SDK Process: USB read: bytes2read = 45, read 45 bytes

Sep 8 13:52:04 infy-desktop SWI0 SDK Process: QM:SDK<-Mdm Notif: ch/Msgid/Msglen/IPCmsglen: 1/0024/42/60

Sep 8 13:52:04 infy-desktop SWI0 SDK Process: [swi_ossdkipcwrite] NOTIF svc 3 msgid 0x36

Sep 8 13:52:04 infy-desktop SWI0 SDK Process: QM:SDK<-Mdm Notif: ch/Msgid/Msglen/IPCmsglen: 3/0024/42/60

Sep 8 13:52:04 infy-desktop SWI0 SDK Process: QM:SDK<-Mdm Notif: ch/Msgid/Msglen/IPCmsglen: 5/0024/42/60

Sep 8 13:52:04 infy-desktop qatesthostx86_64: [amapiwaitnotif] NOTIF svc 3 msgid 0x36

Sep 8 13:52:04 infy-desktop qatesthostx86_64: [swi_osapiipcread] NOTIF svc 3 msgid 0x36

Sep 8 13:52:04 infy-desktop SWI0 SDK Process: USB read: bytes2read = 45, read 45 bytes

Sep 8 13:52:04 infy-desktop SWI0 SDK Process: QM:SDK<-Mdm Notif: ch/Msgid/Msglen/IPCmsglen: 1/0024/42/60

Sep 8 13:52:04 infy-desktop SWI0 SDK Process: [swi_ossdkipcwrite] NOTIF svc 3 msgid 0x36

Sep 8 13:52:04 infy-desktop SWI0 SDK Process: QM:SDK<-Mdm Notif: ch/Msgid/Msglen/IPCmsglen: 3/0024/42/60

Sep 8 13:52:04 infy-desktop SWI0 SDK Process: QM:SDK<-Mdm Notif: ch/Msgid/Msglen/IPCmsglen: 5/0024/42/60

Sep 8 13:52:04 infy-desktop qatesthostx86_64: [amapiwaitnotif] NOTIF svc 3 msgid 0x36

Sep 8 13:52:04 infy-desktop qatesthostx86_64: [swi_osapiipcread] NOTIF svc 3 msgid 0x36

Sep 8 13:52:07 infy-desktop SWI0 SDK Process: USB read: bytes2read = 28, read 28 bytes

Sep 8 13:52:07 infy-desktop SWI0 SDK Process: QM:SDK<-Mdm Notif: ch/Msgid/Msglen/IPCmsglen: 1/0024/25/43

Sep 8 13:52:07 infy-desktop SWI0 SDK Process: [swi_ossdkipcwrite] NOTIF svc 3 msgid 0x36

Sep 8 13:52:07 infy-desktop SWI0 SDK Process: QM:SDK<-Mdm Notif: ch/Msgid/Msglen/IPCmsglen: 3/0024/25/43

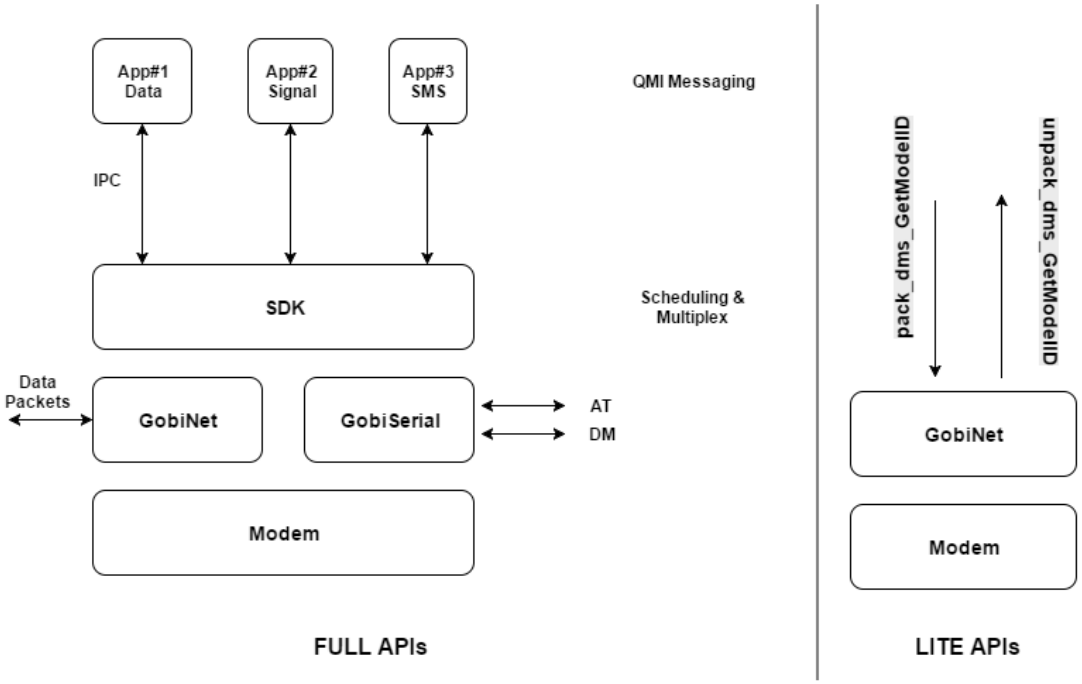
Sep 8 13:52:07 infy-desktop SWI0 SDK Process: QM:SDK<-Mdm Notif: ch/Msgid/Msglen/IPCmsglen: 5/0024/25/43

Sep 8 13:52:07 infy-desktop qatesthostx86_64: [amapiwaitnotif] NOTIF svc 3 msgid 0x36

Sep 8 13:52:07 infy-desktop qatesthostx86_64: [swi_osapiipcread] NOTIF svc 3 msgid 0x36

6. Lite APIs Getting Started

With revision 4.0.0, a set of Lite APIs were introduced to encode or decode QMI messages.



6.1. Using Lite SDK Wrapper to Encode/Decode QMI Messages

These Lightweight API allows developers to pack/unpack QMI messages directly. Developers must handle the QMI device (/dev/qcqmi#) read/write. The packing demo is a utility that exercises most of these lightweight APIs.

Later in this chapter shows you how to implement an application to retrieve the model ID from the modem.

6.2. Steps to Run the Packing Demo Sample App

```
mkdir 400

cd 400

tar xf ../SLQS04.00.10/SLQS04.00.00.tar.gz

make -C SampleApps/lite-qmi-demo/

./SampleApps/lite-qmi-demo/bin/packingdemohostx86_64
```

6.3. Application to Retrieve Modem’s Model ID

```
#include <fcntl.h>
#include <unistd.h>
#include <stdio.h>
#include "dms.h"
#define QMI_GET_SERVICE_FILE_IOCTL  0x8BE0 + 1

int
main()
{
    pack_qmi_t context;
    uint8_t request[255], response[255];
    uint16_t req_len, resp_len;
    unpack_dms_GetModelID_t model_t;

    int qmi_fd = open("/dev/qcqmi0", O_RDWR);
    //register DMS QMI client via ioctl
    ioctl(qmi_fd, QMI_GET_SERVICE_FILE_IOCTL, eDMS);

    //encode qmi request
    context.xid = 0xabcd; // xid must be non-zero
    pack_dms_GetModelID(&context, request, &req_len, NULL);
    write(qmi_fd, request, req_len);
    read(qmi_fd, response, 255);

    //decode qmi response
    unpack_dms_GetModelID( response, resp_len, &model_t );
    printf("model id: %s\n", model_t.modelid);

    close(qmi_fd);
}
```

6.4. Compile and Run

```
cc get-model-id.c -I lite-qmi/inc -llite-qmi -Llite-qmi/lib/hostx86_64 -lpt
hread -o get-model-id
./get-model-id
model id: EM7455
```

6.5. Wrapper Headers and Libraries

```
➜  400  /tmp/sdk_bin/tree lite-qmi/
lite-qmi/
├── inc
│   ├── audio.h
│   ├── cat.h
│   ├── common.h
│   ├── dms.h
│   ├── error_code_helper.h
│   ├── fms.h
│   ├── imsa.h
│   ├── ims.h
│   ├── loc.h
│   ├── msgid.h
│   ├── nas.h
│   ├── pds.h
│   ├── qmap.h
│   ├── qmerrno.h
│   ├── qos.h
│   ├── rms.h
│   ├── sar.h
│   ├── sms.h
│   ├── swiaudio.h
│   ├── swiavms.h
│   ├── swidms.h
```

```
│   ├── swiloc.h
│   ├── swiomaext.h
│   ├── swioma.h
│   ├── switype_256bit.h
│   ├── tmd.h
│   ├── uim.h
│   ├── voice.h
│   └── wds.h
└── lib
    ├── arm
    │   └── liblite-qmi.a
    ├── arm64
    │   └── liblite-qmi.a
    ├── arm64le
    │   └── liblite-qmi.a
    ├── hosti686
    │   └── liblite-qmi.a
    ├── hostx86_64
    │   └── liblite-qmi.a
    ├── mips
    │   └── liblite-qmi.a
    ├── mipsel
    │   └── liblite-qmi.a
    └── ppc
        └── liblite-qmi.a

10 directories, 37 files
```

6.6. One Command Line Lite Firmware Downloader Sample Application

Location: SLQSab.cd.ef /SampleApps/lite-fw-download/

Purpose: Perform a firmware download for the supported module by one command line.

Build:

i686:	make
ARM:	make CPU=arm9
Power PC:	make CPU=ppc
ARM64:	make CPU=arm64
ARM64 LE:	make CPU=arm64le

Execute:

i686:	sudo ./bin/ fwdwl-litehosti686 -m [0/1/2/3/4/5] -f [pathname] -i 1
ARM:	sudo ./bin/ fwdwl-litearm -m [0/1/2/3/4/5] -f [pathname] -i 1
PPC:	sudo ./bin/ fwdwl-liteppc -m [0/1/2/3/4/5] -f [pathname] -i 1
ARM64:	sudo ./bin/ fwdwl-litearm64 -m [0/1/2/3/4/5] -f [pathname] -i 1
ARM64 LE:	sudo ./bin/fwdldarm64le -m [0/1/2/3/4/5] -f [pathname] -i 1

Run ./bin/ fwdwl-litexxx --help to check the usage for the command line options such as different values for the -m option.

Please note that the command highlighted in red above depends on the module you are trying to perform firmware download on. For example, if it is an MDM9x07 module such as WP7603, WP7601 etc. you have to specify the device with –m 2, then the path (folder of firmware images) such as –f /tmp/firmware/WP7603.

7. Tools

7.1. DM Logging Tool

Location: /tools/logging/dm

Purpose: This tool can be used to send DM filters to the device and log raw DM packets for real-time analysis with QPST (remote logging option) or post-hoc analysis (local or remote logging).

Build:

i386:	make
ARM:	make CPU=arm9
Power PC:	make CPU=ppc
MIPS BE:	make CPU=mips
MIPS LE:	make CPU=mipsel

Usage: Navigate to tools/logging/dm and execute **`./dmcapture.sh`** in a shell.

7.2. RAM Dump Tool

Location: /tools/logging/ramdump

Purpose: This tool supports the capturing of the device RAM contents when the device is in boot and hold mode. RAM contents are saved in files written to the current working directory.

Build:

i386:	make
ARM:	make CPU=arm9
Power PC:	make CPU=ppc
MIPS BE:	make CPU=mips
MIPS LE:	make CPU=mipsel

Usage:

Prior to Execution:

1. Enter the following AT commands:

   `at!entercnd="A710"`

   `at!eroption=0`

2. Either reproduce a crash you are investigating, or reset the device

Execution:

Within a shell, execute the following (for i386):

```
./ramdumptooli386 -c<digit>
```

Where /dev/ttyUSB<digit> = DM interface ttyUSB device file in boot and hold mode (usually /dev/ttyUSB0).

Note: This tool works independent of the SDK.

7.3. SQF Filter Editing

Location: /tools/logging/dm/filter/src

Purpose: This tool supports modifying SQF filter via api

Usage:

1. Include header file : sqf.h
2. Create Gobal variable : sqf_t sqf
3. Create buffer for sqf : sqf_createbuffer()
4. Load sqf file (optional) : sqf_load_file()
5. Edit Filter : sqf_set() / sqf_clear()
6. Save sqf file : sqf_save_file()
7. Free Buffer for sqf : sqf_destroybuffer().

Note: This tool works independent of the SDK.

8. Documentation

To view the Full APIs documentation:

1. Navigate to docs/Linux QMI SDK xx.yy.zz - API Reference and open index.html.
2. Click on the modules tab.
3. Select the module of interest e.g. “Short Message Service (SMS)” module.
4. Select the header file e.g. “qaGobiApiSms.h”.

For Lite APIs, please refer to docs/Linux QMI SDK xx.yy.zz - Lite API Reference

Note: *An API function header’s “Device Supported” section contains a list of devices that have been successfully tested against that API.*

9. Reference Documents

[1] SLQS Release Notes

[2] 80-VF459-1 Supplement to Streaming Download Protocol

[3] AirVantage Agent SLQS Integration Guide

Reference: 4115927