



Sierra Wireless Android RIL Release Notes

KitKat 4.4 RELEASE

Revision:	V4.4.1.0
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1 General

1.1 Purpose

This document describes the Sierra Wireless Android KitKat 4.4 RIL Release.

1.2 Summary of Document Revision History

Date	Author	Summary of Changes
2 May 2014	Leo Lee	Initial version for V3.2.2.0
30 May 2014	Leo Lee	Update for V3.2.4.0
20 Nov 2014	Leo Lee	Update for V3.2.15.0
2 Dec 2014	Stanley Ng	Update for V3.2.16.0
13 Feb 2015	Stanley Ng	Update for V4.4.1.0

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2 Supported Configurations

2.1 Release Configurations Supported

These release notes apply to the following release configurations:

AndroidRIL_V4.4.1.0_ARM_4.4_V1.0_bin
Android RIL version 4.4.1.0
Supports ARM based processors, armv7-a variant and higher
For Android KitKat (4.4)
Binary only release

2.2 Sierra Modules Supported

The Android RIL supports the following devices and firmware versions:

- MC8305 (G3K) - firmware version 1580 and 3.3
- MC8355 (G3K) - firmware version 1580 and 3.3
- MC7700 - firmware version SWI9200X_03.05.16.01 (or greater)
- MC7710 - firmware version SWI9200X_03.05.16.01 (or greater)
- MC7750 - firmware version SWI9600M_03.05.10.05 (or greater)
- SL909x - firmware version 331403 (and greater)
- SL8092 - firmware version SWI9600P_02.00.01.01 (or greater)
- MC7355 - firmware version SWI9X15C_05.05.10 (or greater)
- MC7354 - firmware version SWI9X15C_05.04.02 (or greater)
- MC7304 - firmware version SWI9X15C_05.04.02 (or greater)
- EM7355 - firmware version SWI9X15C_05.05.16 (or greater)
- EM7330 - firmware version SWI9X15C_05.05.22 (or greater)
- EM7305 - firmware version SWI9X15C_05.05.16 (or greater)
- EM8805 - firmware version SWI9X15C_05.05.16 (or greater)
- HL85XX - firmware version BHL85xx.5.5.12.0 (or greater)

The MC7700 and MC7710 modules can be configured to operate in “QMI Mode” or “Direct-IP” mode. For this RIL to operate properly, the devices must be in “QMI Mode”.

MC73xx, MC7750, MC8305, MC8355 and SL909x only support QMI mode so they will work by default.

MC73xx support multi PDN by default, it needs to switch back to single PDN to work with Android RIL.

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3 Supported Android RIL APIs

The table below lists the Android RIL APIs that are supported in the Kitkat 4.4 RIL.

Android APIs	Notes
Device Information Requests	
RIL_REQUEST_GET_IMSI	
RIL_REQUEST_DEVICE_IDENTITY	
RIL_REQUEST_BASEBAND_VERSION	
Data Call Requests	
RIL_REQUEST_SETUP_DATA_CALL	
RIL_REQUEST_DEACTIVATE_DATA_CALL	
RIL_REQUEST_DATA_CALL_LIST	
RIL_REQUEST_LAST_DATA_CALL_FAIL_CAUSE	
Network Related Requests	
RIL_REQUEST_SIGNAL_STRENGTH	
RIL_REQUEST_RADIO_POWER	
RIL_REQUEST_OPERATOR	
RIL_REQUEST_SET_BAND_MODE	
RIL_REQUEST_QUERY_AVAILABLE_BAND_MODE	
RIL_REQUEST_SET_NETWORK_SELECTION_AUTOMATIC	
RIL_REQUEST_SET_NETWORK_SELECTION_MANUAL	
RIL_REQUEST_QUERY_NETWORK_SELECTION_MODE	
RIL_REQUEST_QUERY_AVAILABLE_NETWORKS	
RIL_REQUEST_SET_PREFERRED_NETWORK_TYPE	LTE is not yet supported
RIL_REQUEST_GET_PREFERRED_NETWORK_TYPE	LTE is not yet supported
RIL_REQUEST_VOICE_REGISTRATION_STATE	
RIL_REQUEST_DATA_REGISTRATION_STATE	
RIL_REQUEST_SET_LOCATION_UPDATES	
RIL_REQUEST_GET_NEIGHBORING_CELL_IDS	Partial Support for 3G only AT RIL only
SIM Related Requests	
RIL_REQUEST_SIM_IO	

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RIL_REQUEST_GET_SIM_STATUS	
RIL_REQUEST_ENTER_SIM_PIN	
RIL_REQUEST_ENTER_SIM_PUK	
RIL_REQUEST_ENTER_SIM_PIN2	
RIL_REQUEST_ENTER_SIM_PUK2	
RIL_REQUEST_CHANGE_SIM_PIN	
RIL_REQUEST_CHANGE_SIM_PIN2	
RIL_REQUEST_QUERY_FACILITY_LOCK	
RIL_REQUEST_SET_FACILITY_LOCK	
RIL_REQUEST_ENTER_NETWORK_DEPERSONALIZATION	
SMS Requests	
RIL_REQUEST_SEND_SMS	
RIL_REQUEST_SMS_ACKNOWLEDGE	
RIL_REQUEST_CDMA_SEND_SMS	QMI RIL only
RIL_REQUEST_CDMA_SMS_ACKNOWLEDGE	QMI RIL only
RIL_REQUEST_WRITE_SMS_TO_SIM	
RIL_REQUEST_DELETE_SMS_ON_SIM	
RIL_REQUEST_GET_SMSC_ADDRESS	
RIL_REQUEST_SET_SMSC_ADDRESS	
CDMA Specific Requests	
RIL_REQUEST_CDMA_SUBSCRIPTION	QMI RIL only
RIL_REQUEST_CDMA_SET_SUBSCRIPTION_SOURCE	Hard-coded to always return success. QMI RIL only
RIL_REQUEST_CDMA_QUERY_ROAMING_PREFERENCE	QMI RIL only
RIL_REQUEST_CDMA_SET_ROAMING_PREFERENCE	QMI RIL only
Voice Call Related Requests	
RIL_REQUEST_GET_CURRENT_CALLS	
RIL_REQUEST_DIAL	
RIL_REQUEST_HANGUP_FOREGROUND_RESUME_BACKGROUND	
RIL_REQUEST_HANGUP	
RIL_REQUEST_ANSWER	
RIL_REQUEST_HANGUP_WAITING_OR_BACKGROUND	
RIL_REQUEST_SWITCH_WAITING_OR_HOLDING_AND_ACTIVE	
RIL_REQUEST_CONFERENCE	
RIL_REQUEST_SEPARATE_CONNECTION	
RIL_REQUEST_EXPLICIT_CALL_TRANSFER	
RIL_REQUEST_GET_CLIR	UMTS only

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RIL_REQUEST_SET_CLIR	UMTS only
RIL_REQUEST_QUERY_CALL_FORWARD_STATUS	UMTS only
RIL_REQUEST_SET_CALL_FORWARD	UMTS only
RIL_REQUEST_QUERY_CALL_WAITING	UMTS only
RIL_REQUEST_SET_CALL_WAITING	UMTS only
RIL_REQUEST_UDUB	
RIL_REQUEST_QUERY_CLIP	UMTS only
RIL_REQUEST_LAST_CALL_FAIL_CAUSE	UMTS only
RIL_REQUEST_SET_MUTE	
RIL_REQUEST_GET_MUTE	
RIL_REQUEST_SET_SUPP_SVC_NOTIFICATION	AT RIL only
RIL_REQUEST_DTMF_START	
RIL_REQUEST_DTMF_STOP	
USSD Requests	
RIL_REQUEST_SEND_USSD	
RIL_REQUEST_CANCEL_USSD	
Miscellaneous Requests	
RIL_REQUEST_SCREEN_STATE	
RIL_REQUEST_OEM_HOOK_STRINGS	Used for custom command support QMI RIL only
RIL_REQUEST_RESET_RADIO	See note in section 8.8.4 QMI RIL only
Unsolicited Responses	
RIL_UNSOL_RESPONSE_RADIO_STATE_CHANGED	
RIL_UNSOL_SIGNAL_STRENGTH	
RIL_UNSOL_RESPONSE_NETWORK_STATE_CHANGED	
RIL_UNSOL_NITZ_TIME_RECEIVED	
RIL_UNSOL_DATA_CALL_LIST_CHANGED	
RIL_UNSOL_RESPONSE_NEW_SMS	
RIL_UNSOL_RESPONSE_CDMA_NEW_SMS	QMI RIL only
RIL_UNSOL_CDMA_OTA_PROVISION_STATUS	QMI RIL only
RIL_UNSOL_RESPONSE_NEW_SMS_STATUS_REPORT	Not supported on MC83x5 modems
RIL_UNSOL_RESPONSE_CALL_STATE_CHANGED	
RIL_UNSOL_OEM_HOOK_RAW	Used for custom command support QMI RIL only
RIL_UNSOL_ON_USSD	
RIL_UNSOL_CALL_RING	AT RIL only
RIL_UNSOL_SUPP_SVC_NOTIFICATION	AT RIL only

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4 Install Instructions

4.1 Installing Android RIL on KitKat 4.4 platform

Please refer to the instructions in the following file contained within the distribution:

For ARM based platforms:
 \ReleaseARM\readme.txt

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5 Revision History

5.1 Version 4.4.1.0

- Fix PIN/PIN2 doesn't work on HL85xx
- Add GPS support for HL85xx
- Port firmware updater of HL85xx to Android

5.2 Version 3.2.16.0

- Add support to HL85xx series modem

5.3 Version 3.2.15.0

- Fix data connection does not work on both Sprint LTE and HDR.
- Fix data connection does not work on Verizon LTE.
- Fix MO SMS does not work on Verizon LTE.
- Fix RADIO_UNAVAILABLE after selecting the roaming mode of CDMA
- Fix no NMEA data due to open port failed.
- Fix operator name shown incorrect in CDMA network.
- Fix MDN/MIN are not populated in Settings->Status.
- Fix DTMF response slow and sometimes crash the phone app.
- Fix RIL_REQUEST_SET_INITIAL_ATTACH_APN return failed if the authentication of APN profile does not set.
- Support EM8805 module.
- Support SMS over IMS feature in dual mode.

5.4 Version 3.2.4.0

- Fix the signal strength icon incorrect on LTE network issue.
- Support EM series modules.
- Update the GobiNet driver to version 2.24.

5.5 Version 3.2.2.0

- Add Android 4.4 KitKat support

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6 Known Limitations

The following known issues exist in Android 4.4 RIL. We will work to resolve them in a future release.

- No

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7 Planned Feature Enhancements

7.1 Planned Feature Enhancements

The following features are planned to be supported in a future release of the RIL:

- OTASP/OMADM support for MC73xx series modem
- Verify voice related features on EM/MC73xx series modem

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8 Usage Instructions

This section provides information and instructions on using the RIL with the supported modems described in section 2.2.

Note that some of the discussed topics are only applicable to one type of modem. This will be noted in the descriptions.

8.1 Custom RIL Commands

Applications use `Phone.invokeOemRilRequestStrings()` to invoke custom RIL commands. This method is defined in `Phone.java` as:

```
void invokeOemRilRequestStrings(String[] strings, Message response);
```

The custom command is specified in `strings[0]`; arguments for the custom command are specified in `strings[1]`, etc. The currently supported custom commands are defined in `RILConstants.java`:

```
String OEM_HOOK_STRING_RIL_VERSION = "4";
String OEM_HOOK_STRING_CDMA_ACTIVATION = "5";
String OEM_HOOK_STRING_FACTORY_RESET = "6";
String OEM_HOOK_STRING_PRL_UPDATE = "7";
String OEM_HOOK_STRING_SAR_GET = "8";
String OEM_HOOK_STRING_SAR_SET = "9";
String OEM_HOOK_STRING_SET_SMS_WAKE = "10";
String OEM_HOOK_STRING_GET_ppDATA = "11";
String OEM_HOOK_STRING_SET_ppDATA = "12";
String OEM_HOOK_STRING_VALIDATE_SPC = "13";
String OEM_HOOK_STRING_READ_SIM_PB = "14";
String OEM_HOOK_STRING_OMADM_CANCEL = "15";
String OEM_HOOK_STRING_GET_NOISE_SUPPRESSION = "16";
String OEM_HOOK_STRING_SET_NOISE_SUPPRESSION = "17";
String OEM_HOOK_STRING_GET_MODEM_VOLUME = "18";
String OEM_HOOK_STRING_SET_MODEM_VOLUME = "19";
```

8.1.1 CDMA Activation

For CDMA activation, `strings` should be:

```
strings[0] = RILConstants.OEM_HOOK_STRING_CDMA_ACTIVATION;
```

There are no arguments for this custom command. See section 8.2 for details about how to use CDMA activation.

This command only applies to MC8355 Sprint and Verizon images.

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8.1.2 User initiated PRL Update

For user initiated PRL Update, `strings` should be:

```
strings[0] = RILConstants.OEM_HOOK_STRING_PRL_UPDATE;
```

There are no arguments for this custom command. The modem will reset after a successful PRL update. If the update fails, then either the RIL command will return an error right away, or `Phone.CDMA_OTA_PROVISION_STATUS_OTAPA_ABORTED` will be sent. See section 8.2.1 for details on how to register for and receive this notification.

This command should not be used when there is an active data session. If an attempt is made to use this command when there is an active data session, the command will fail, and `Phone.CDMA_OTA_PROVISION_STATUS_OTAPA_ABORTED` will be sent.

This command only applies to MC8355 Sprint images.

8.1.3 Factory Reset

For factory reset, `strings` should be:

```
strings[0] = RILConstants.OEM_HOOK_STRING_FACTORY_RESET;  
strings[1] = <SPC>;
```

The service programming code (SPC) to use depends on the carrier. For carriers other than Sprint, it should be six zeros, i.e. "000000". For Sprint, it is modem specific, and should be obtained from Sprint.

The modem will reset after a successful factory reset. If the factory reset fails, then the RIL command will return an error right away.

This command only applies to MC8355 modems. It is targeted for Sprint images, but this command should work for any carrier images.

8.1.4 Get Current SAR Back-off State

For getting the current SAR state, `strings` should be:

```
strings[0] = RILConstants.OEM_HOOK_STRING_SAR_GET;
```

There are no arguments for this custom command. The response will contain a value between 0 and 8 that indicates the current SAR back-off state.

This command applies to both MC8355 and MC77xx modems. For MC7700 modems, only the 1.x FW versions are supported.

8.1.5 Set Current SAR Back-off State

For setting the current SAR state, `strings` should be:

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```
strings[0] = RILConstants.OEM_HOOK_STRING_SAR_SET;  
strings[1] = <SAR state>;
```

The <SAR state> should be a number between 0 and 8, represented as a string.

This command applies to both MC8355 and MC77xx modems. For MC7700 modems, only the 1.x FW versions are supported.

8.1.6 Enable Wake on SMS

For enabling/disabling wake on SMS, strings should be:

```
strings[0] = RILConstants.OEM_HOOK_STRING_SET_SMS_WAKE;  
strings[1] = <enabled>;  
strings[2] = <wake mask>;
```

The <enabled> parameter is 1 for enable and 0 for disable. The <wake mask> parameter is a decimal number up to 8 digits in length. All parameters should be represented as strings. See document “Gobi 2000 Wake on Wireless WAN Specification” for details on how to use the Wake on SMS feature.

This command only applies to MC8355.

8.1.7 Get data for ##data and ##debug

For reading data to support ##data and ##debug, strings should be:

```
strings[0] = RILConstants.OEM_HOOK_STRING_GET_ppDATA;
```

The status returned by OEM_HOOK_STRINGS will be either success or failure. If the status is success, then the output response is a list of strings in the following order:

USER_NAI	NAI string of MIP profile, ASCII string
REV_TUNNELING_SETTING	Reverse Tunneling of MIP profile, one byte long decimal string
HA_SPI	HA SPI of MIP profile, up to 4 bytes long hexadecimal value string
AAA_SPI	AAA SPI of MIP profile, up to 4 bytes long hexadecimal value string
HOME_IP	Home address(IPv4) of MIP profile, up to 4 bytes long hexadecimal value string
PRIMARY_HA_IP	HA address(IPv4) of MIP profile, up to 4 bytes long hexadecimal value string
SECONDARY_HA_IP	AAA address(IPv4) of MIP profile, up to 4 bytes long hexadecimal value string
MEID	MEID, ASCII string
P_ESN	ESN, ASCII string
STATION_CLASS_MARK	Station Class Mark, one byte long decimal string
SLOTTED_MODE_INDEX	Slot Cycle Index, one byte long decimal string
HOME_NID	Home NID, one byte long decimal string
HOME_SID	Home SID, one byte long decimal string
ACCOLC	ACCOLC, one byte long decimal string
HOME_SYS_REG	Register on home system, one byte long decimal string

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FSID	Register on foreign system, one byte long decimal string
FNID	Register on foreign network, one byte long decimal string
1X_CHANNEL	1xrtt channel number, up to 4 bytes long decimal string
1X_BAND_CLASS	1xrtt band class, up to 4 bytes long decimal string
1X_SYSTEM_ID	1xrtt system ID, up to 4 bytes long decimal string
1X_NETWORK_ID	1xrtt network ID, up to 4 bytes long decimal string
1X_BASE_ID	1xrtt base ID, up to 4 bytes long decimal string
1X_LATITUDE	1xrtt base station latitude, up to 4 bytes long hexadecimal value string
1X_LONGITUDE	1xrtt base station longitude, up to 4 bytes long hexadecimal value string
1X_RX_PWR	1xrtt RSSI, up to 4 bytes long decimal string
1X_RX_ECIO	1xrtt ECIO, up to 4 bytes long decimal string
1X_RX_ERROR_RATE	1xrtt error rate, up to 4 bytes long decimal string
EVDO_CHANNEL	EVDO channel number, up to 4 bytes long decimal string
EVDO_RX_PWR	EVDO RSSI, up to 4 bytes long decimal string
EVDO_RX_PER	EVDO Packet Error Rate, up to 4 bytes long decimal string
EVDO_RX_SINR	EVDO SINR, up to 4 bytes long decimal string
EVDO_AN_AAA_STATUS	EVDO AN-AAA status, up to 4 bytes long decimal string
EVDO_PRL	PRL version, up to 4 bytes long decimal string
AMSS_VERSION	Firmware version, ASCII string
P_REV	Protocol version, up to 4 bytes long decimal string
PACKET_DATA_PROFILE	Active MIP profile number, one byte long decimal string

This command only applies to MC8355 Sprint images.

8.1.8 Set data for ##data

For setting data to support ##data, strings should be:

```
strings[0] = RILConstants.OEM_HOOK_STRING_SET_ppDATA;
```

followed by the values to write in the following order:

SPC	Service Programming Code, expecting up to 6 bytes long decimal value string
USER_NAI	NAI string of MIP profile, expecting ASCII string
REV_TUNNELING_SETTING	Reverse Tunneling of MIP profile, expecting one byte long decimal string
HA_SPI	HA SPI of MIP profile, expecting up to 4 bytes long hexadecimal value string
HA_PASSWORD	HA password of MIP profile, expecting ASCII string
AAA_SPI	AAA SPI of MIP profile, expecting up to 4 bytes long hexadecimal value string
AAA_PASSWORD	AAA password of MIP profile, expecting ASCII string
HOME_IP	Home address(IPv4) of MIP profile, expecting up to 4 bytes long hexadecimal value string
PRIMARY_HA_IP	Primary HA address(IPv4) of MIP profile, expecting up to 4 bytes long hexadecimal value string
SECONDARY_HA_IP	Secondary HA address(IPv4) of MIP profile, expecting up to 4 bytes long hexadecimal value string
ACCOLC	ACCOLC, expecting one byte long decimal string

There is no output response data for this command; just a success or failure status.

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This command only applies to MC8355 Sprint images.

8.1.9 Validate SPC

For validating the SPC, strings should be:

```
strings[0] = RILConstants.OEM_HOOK_STRING_VALIDATE_SPC;  
strings[1] = <spc>;
```

The <spc> parameter is the Service programming code, as a string up to 6 digits long. The return status will be either success or failure. If the status is success, then the output response is a list of strings, containing a single string. This response string will be “1” if the SPC is valid and “0” if the SPC is not valid.

This command only applies to MC8355.

8.1.10 Read_SIM_Phonebook

For reading the SIM phonebook, strings should be:

```
strings[0] = RILConstants.OEM_HOOK_STRING_READ_SIM_PB;
```

The return status will be either success or failure. If the status is success, then the output response is a list of strings, containing all of the phonebook entries from the SIM. Each string will contain one phonebook entry. The format of a phonebook entry is as defined for the AT+CPBR command: <index>,<number>,<type>,<text>.

8.1.11 OMA-DM Cancel

For OMA-DM Cancel, strings should be:

```
strings[0] = RILConstants.OEM_HOOK_STRING_OMADM_CANCEL;
```

There are no arguments for this custom command. The return status will be either success or failure. There is no data in the command response.

This command can be used to cancel either network-initiated or client-initiated OMA-DM sessions.

This command only applies to MC8355 Sprint images.

8.2 CDMA Activation for MC8355 Modems

The Sierra RIL handles the details of the CDMA activation procedure. Sprint uses OMA-DM and Verizon uses OTASP. The following description is specific to the Android 2.2

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(Froyo) release. The assumption is that the target Android release will provide the same or very similar functionality.

8.2.1 Application Layer Operation

The Android Application layer will use the following APIs to trigger a CDMA Activation session and receive status information. From the Android layer, the Activation procedure is the same for Sprint and Verizon.

Initiate Activation:

- `Phone.invokeOemRilRequestStrings()`
- Exact method parameters are still TBD, and will be carrier specific.

Register for Status Notifications

- `Phone.registerForCdmaOtaStatusChange()`
- Although the name mentions OTA, it will be used for all activations.

Status Activation Started:

- `Phone.CDMA_OTA_PROVISION_STATUS_OTAPA_STARTED`
- Sent to the registered method when activation has started

Status Activation Complete:

- `Phone.CDMA_OTA_PROVISION_STATUS_COMMITTED`
- Sent to the registered method when activation has completed

Status Activation Failed:

- `Phone.CDMA_OTA_PROVISION_STATUS_OTAPA_ABORTED`
- Sent to the registered method when activation has failed.

8.2.2 Activation Application Implementation

Currently, activation is done through the PhoneApp using a dialing interface. In order to implement customer specific activation requirements, either changes need to be made to the PhoneApp, or a new Activation App must be created. See comments in `OtaStartupReceiver.java` (in packages/apps/Phone/src/com/android/phone) for details on how to disable the default behaviour and provide a custom Activation App.

The following will discuss the minimum changes required to the PhoneApp, in order to use the APIs described above. This does not include any customer specific UI changes. Note that this is just example code, and there may be better ways to do this, depending on particular customer requirements.

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8.2.2.1 *Initiate Activation*

In OtaUtils.java, modify otaPerformActivation() to be:

```
private void otaPerformActivation() {
    if (DBG) log("otaPerformActivation()...");

/* SWISTART */
    PhoneApp app = PhoneApp.getInstance();
    Phone phone = app.phone;
/* SWISTOP */

    if (!mApplication.cdmaOtaProvisionData.inOtaSpcState) {
/* SWISTART */
        /* Exact parameters TBD */
        phone.invokeOemRilRequestStrings(null, null);
/* SWISTOP */
        otaShowListeningScreen();
    }
    return;
}
```

8.2.2.2 *Handle Status Activation Complete*

In OtaUtils.java, modify the switch statement in onOtaProvisionStatusChanged() for the Phone.CDMA_OTA_PROVISION_STATUS_COMMITTED case to be:

```
case Phone.CDMA_OTA_PROVISION_STATUS_COMMITTED:
    otaShowInProgressScreen();
    mApplication.cdmaOtaProvisionData.isOtaCallCommitted = true;
    if (DBG) log("onOtaProvisionStatusChanged(): DONE,
        isOtaCallCommitted set to true");
/* SWISTART */
    otaShowSuccessFailure();
/* SWISTOP */
    break;
```

8.3 **Multi-Carrier Firmware Image Management on MC8355**

8.3.1 **Image Management Overview**

The MC8355 supports a multi-carrier image management solution. This solution allows the host client to switch between different carrier firmware images and configuration files in order to support operation on those carriers.

In order to support this within an Android OS, a custom application must be written. This application must be able to do the following:

- Read a list of supported Carrier images

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Display the list to end user
Allow end user to select the requested Carrier from the list
Trigger the switching to a new carrier image

The MC8355 will support the following carrier images at this time:

Verizon
Sprint
AT&T
Vodafone
T-Mobile
Telefonica
Generic HSPA

8.3.2 Application Layer Operation

The application layer should call the SierraImgMgr executable described below to run the image switching.

Print a list of supported carrier images:

```
SierraImgMgr --list <image directory>
```

A list of all available carrier images in <image directory> will be printed. The list will include the following comma-separated fields: Id, Carrier, Technology, Region, Version and Status.

For example, if there are 3 images with the Sprint image being currently selected, the output might be:

```
Id,Carrier,Technology,Region,Version,Status  
2,AT&T,UMTS,NA,0E123456,Inactive  
3,Sprint,CDMA,NA,0E223456,Active  
6,Generic HSPA,UMTS,Global,0E323456,Inactive
```

The Id values will always be the same for a given carrier.

Trigger the switch to new carrier image:

```
SierraImgMgr --select <Id> <image directory>
```

The Id value must be one of the values returned by the --list option, and is used to select the active image. The --select option may cause the modem to reset. The command will not return until the modem has finished resetting and the new carrier image is successfully running.

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Update images on the modem:

```
SierraImgMgr --update <image directory>
```

This will update all the images that are currently on the modem with newer image files, if they are available. If there is no newer image file available for a particular carrier, then nothing will be done with that carrier image on the modem.

The --update option does not change the active carrier selection.

Print a list of carrier images on the modem:

```
SierraImgMgr --listdevice
```

A list of available carrier images on the modem will be printed. The list will follow the same format that is used by the --list option explained earlier.

Trigger the switch to new carrier image on the modem

```
SierraImgMgr --selectdevice <Id> [<config file path>]
```

The Id value must be one of the values returned by the --listdevice option, and is used to select the active image.

The config file path value gives the path to the optional configuration file. If there are multiple versions of the same modem image on the modem, then this config file is used to determine which image version to use for a particular carrier. If there is no config file in this case, then the first version of the modem image that is found will be used.

An example of the config file is given below:

```
#Sprint Image
SP=1579
#Verizon Image
VE=1579
#Vodafone Image
VO=1580
#AT&T Image
AT=1580
#T-Mobile Image
TM=1575
#Generic UMTS Image
GE=1580
#Telefonica Image
TE=1575
#Telecom Italia Image
TI=1575
#Orange Image
OR=1575
```

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Any lines starting with '#' are comments. Spaces are not allowed in the assignment of the image version number to the image symbol.

The --selectdevice option may cause the modem to reset. The command will not return until the modem has finished resetting and the new carrier image is successfully running.

Notes:

- the <image directory> argument must be the absolute path to the images directory. It should not contain any spaces.
- the --select, --update, --listdevice and --selectdevice options conflict with the RIL daemon. To ensure correction operation, always stop the RIL daemon before using these options, and restart the daemon afterwards.

Example Usage (from shell command line):

```
stop ril-daemon
SierraImgMgr --list /data/modem/images
SierraImgMgr --select 2 /data/modem/image
start ril-daemon
```

The above can be easily adapted to be called from a Java application.

8.3.3 Image Directory

The image distribution package will contain the images directory. This directory will itself contain a number of sub-directories, usually named with small numbers. It is essential that these sub-directories are never renamed, and that files are not moved from one sub-directory to another sub-directory.

This images directory can be put in any customer specific location. The absolute path to the image library must always be given to the SierraImgMgr executable. This path should include the images directory, as given in the example above.

If a new image distribution package is released, use the following steps to update the images used by the modem:

- To keep any images that have not been updated, merge the new images directory with the existing directory, replacing any existing files.
- To only use the newly released images, delete the existing images directory first, and then put the new directory in the same place.
- Execute SierraImgMgr with the --update option as described above.

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8.4 SAR Back-off Tool

A command line tool, SierraSARTool, which runs in the adb shell or an Android console, is provided to get and set the current SAR state value.

This tool is targeted at MC8355 modems, although the set command also works with some FW versions of MC7700 modems. For MC77xx modems, AT commands are available which provide similar functionality.

Query the current SAR value:

```
SierraSARTool /* without arguments */
```

Set the current value to new SAR state:

```
SierraSARTool <new SAR State>
```

Note that this tool cannot run at the same time as the RIL daemon. Therefore, always stop the RIL daemon before using this command, and restart the daemon afterwards.

Example Usage (from adb shell command line):

```
stop ril-daemon
SierraSARTool /* to query current value */
SierraSARTool 4 /* to set the new value to 4 */
start ril-daemon
```

8.5 Firmware Image Download on MC77xx

The SierraFwDI77xx executable is provided for downloading firmware to MC77xx modems. It is a command line tool and is available in /system/bin. The -h option can be used to get usage information. The command options and usage of these options is provided below:

- -h --help
 - Display this information and exit
- -? --help
 - Display this information and exit
- -v --verbose
 - Display extra info while running. NOTE: specify 'verbose' first
- -g --get

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- Display the information for the executing device image
- -d --download <CWEImagepath>
 - CWE image to be downloaded is at <CWEImagepath> . NOTE: this must be an absolute path
- -i --info <CWEImagepath>
 - Display the information for a particular CWE image file located at <CWEImagepath>. NOTE: this must be an absolute path

8.6 Firmware Image Download on SL809x

Firmware updates are released as CWE files. The swifwdnld executable is provided to update the modem firmware from the adb shell.

Usage:

```
- cd /system/data  
- ./swifwdnld -p ./swisdsk -f /data/<file.cwe> -x
```

The FW update may take several minutes. The modem will reboot at the end of the update.

8.7 Remote DM Logging

Remote DM logging can be used to connect the DM port on the modem under Android to a Windows PC application that uses the DM port, such as QXDM. There are several options to enable remote DM logging (also called DM port forwarding). The SierraDMLog executable is provided to help with this process. The -h option can be used to get usage information. The command options and usage of these options is provided below:

Local Logging:

- SierraDMLog -l [-d device] [-f filter] [-o logfile]:
 - Logs DM packets to "logfile" if specified, or to a script generated log file stored in the /data directory with name swidmlog if not specified.

Remote Logging:

- SierraDMLog [-d device] [-f filter] [-p netport] [-r rhost]
 - Establishes a TCP connection with a remote machine "rhost" using port number "netport", or a default port number of 2500 if not specified. DM packets are exchanged over the TCP connection.

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- Without the -r option, acts as a server application waiting for an incoming connection request. Otherwise, acts as a client and attempts to establish a connection with "rhost".

OPTIONS:

- -l - Local logging if specified, remote logging otherwise
- -d device - (Optional) /dev/ttyUSBx port for DM logging
- -f filter - (Optional) DM filter to send to the device prior to logging
- -p netport - (Optional) Remote logging TCP port (defaults to 2500)
- -r rhost - (Optional) remote host to connect to
- -o logfile - (Optional) fully qualified DM log (output) file name

If the DM port is not specified using -d option, then it will be automatically detected by the command. In this case, the port name will be printed out, since it is needed for some of the other steps, as described in the examples below.

All of the examples below assume the DM port on the Android device is /dev/ttyUSB0.

Using USB cable with Windows host computer:

- 1) Execute "adb shell SierraDMLog -d /dev/ttyUSB0"
- 2) Execute "adb forward tcp:2500 dev:/dev/ttyUSB0"
- 3) On Windows host using QPST, configure "IP Server" to use IP 127.0.0.1 and port number 2500 to connect to device.

An alternative for USB connection with Windows host computer:

- 1) Enable USB tethering in Phone/Tablet Settings->Wireless & Networks -> Tethering and & Portable hotspot -> USB tethering
- 2) Use "adb shell netcfg" to get ip address of USB0
- 3) Use USB cable to connect to host, then use "ipconfig" find ip address of host device
- 4) Use "adb shell SierraDMLog -d /dev/ttyUSB0 -r xx.xx.xx.xx"
- 5) On host computer, launch QPST to add port
- 6) On host computer, run QXDM

Using Wifi hotspot provided by the phone/tablet:

- 1) Enable Wifi in phone/tablet settings -> Wireless & Networks -> Wifi
- 2) Enable hotspot functionality in Settings ->Wireless & Networks -> Tethering and & Portable hotspot ->Portable Wifi hotspot
- 3) On host computer, use Wifi to connect to access point "AndroidAP"
- 4) Use "adb shell SierraDMLog -d /dev/ttyUSB0 -r xx.xx.xx.xx"
- 5) In host computer, launch QPST to add port
- 6) In host computer, run QXDM

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8.8 RIL Commands

This section provides additional information on using some of the standard RIL commands.

8.8.1 SIM Related Commands

From the RIL documentation, it is unclear whether it is acceptable to return valid data in the RIL command response, when the response status is not RIL_E_SUCCESS. However, for some RIL commands, it is necessary to return data even when an error occurs.

For the RIL commands

- RIL_REQUEST_ENTER_SIM_PIN
- RIL_REQUEST_ENTER_SIM_PIN2
- RIL_REQUEST_ENTER_SIM_PUK
- RIL_REQUEST_ENTER_SIM_PUK2

there is no other documented mechanism available to return the number of retries when the status is RIL_E_PASSWORD_INCORRECT. Thus, for these commands, when the status is either RIL_E_SUCCESS or RIL_E_PASSWORD_INCORRECT, the number of retries is returned in the command response. Note that the format of the command response has not changed, and follows the documented format in the ril.h header file.

A corresponding change in the telephony framework is necessary, in order to extract the retry count from the command response when the status is RIL_E_PASSWORD_INCORRECT, because this is normally only done when the status is RIL_E_SUCCESS.

8.8.2 RIL_REQUEST_SCREEN_STATE Command

This RIL command enables or disables the following unsolicited responses:

- RIL_UNSOL_SIGNAL_STRENGTH
- RIL_UNSOL_RESPONSE_NETWORK_STATE_CHANGED
- RIL_UNSOL_NITZ_TIME_RECEIVED

If these responses are disabled, then the corresponding notifications from the modem are also disabled.

The following unsolicited responses are not controlled by this RIL command.

- RIL_UNSOL_RESPONSE_RADIO_STATE_CHANGED

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- RIL_UNSOL_DATA_CALL_LIST_CHANGED
- RIL_UNSOL_RESPONSE_NEW_SMS
- RIL_UNSOL_RESPONSE_CDMA_NEW_SMS

The following unsolicited response only occurs when using some of the custom RIL commands described in section 8.1, and so will not occur during normal RIL operation.

- RIL_UNSOL_CDMA_OTA_PROVISION_STATUS

Note that the full list of unsolicited responses supported by the RIL is given in section 3.

8.8.3 RIL_REQUEST_QUERY_AVAILABLE_NETWORKS Command

This RIL command is used to query available GSM/UMTS/LTE networks

- This command requires radio resources, and so cannot be used when there is an active data session. In this case, an error will be returned immediately.
- This command may take up to 5 minutes to execute. If the network scan has not been completed after 5 minutes, an error will be returned.

8.8.4 RIL_REQUEST_RESET_RADIO Command

This RIL command can be used to reset the modem. Although this command has been deprecated, it is still supported in the telephony framework, and no alternative command has been defined that can be used to reset the modem.

8.8.5 SMS SIM Related Commands

The following are the SMS SIM related commands.

- RIL_REQUEST_WRITE_SMS_TO_SIM
- RIL_REQUEST_DELETE_SMS_ON_SIM

The message/record index for these commands starts at 1, to match the telephony framework which assumes that SMS messages stored on the SIM start at index 1.

8.8.6 Receiving SMS Related Commands and Notifications

To prevent SMS storage on the modem from becoming full, when an incoming SMS is acknowledged by either the SMS_ACKNOWLEDGE or

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CDMA_SMS_ACKNOWLEDGE commands, as appropriate for the type of incoming SMS, then the SMS will be deleted from modem storage.

In addition, the first time the new RIL (v1.1.9 or higher) runs on the host device, it will check for any received messages on the modem, and send these to the telephony framework. As a result, the user could receive a number of SMS messages that had already been previously received.

8.8.7 RIL_REQUEST_SET_NETWORK_SELECTION_MANUAL command

If manual registration is attempted with a de-activated SIM, then this command will return ILLEGAL_SIM_OR_ME. To verify that the SIM is de-activated, this command will ensure that

- manual registration fails with a “no network service” error (CME ERROR 30)
- after manual registration fails, the registration state is denied

8.8.8 Voice Related Commands

In order to use the voice related RIL commands:

- the modem must have voice support. This is currently only the SL909x
- the ro.sierra.voice property must be set to 1

8.9 CDMA LTE Phone Object

This is a new phone object that will be used to support MC7750 modems on the Verizon network. In order to enable this phone object, the following must be done:

1. Add the property setting

```
telephony.lteOnCdmaDevice=1
```

into an appropriate property file, such as system.prop

2. Ensure that the network mode is 7. If the network mode is not already 7, then this can be done by deleting the database file:

```
/data/data/com.android.providers.settings/databases/settings.db
```

This file will get regenerated when the system boots. Assuming that the property in step 1 is set, the network mode will be initialized to 7.

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Initial support has been added in the RIL to auto-detect the MC7750, and set the appropriate property, if the property is not already set. See section 8.13 for details.

8.10 Java App for Capturing Radio and Main Logs

DISCLAIMER:

This App is intended for use with Sierra Wireless modems and should only be used for diagnostic and testing purposes. This App should not be included in any shipping product, due to potential privacy and security issues.

Installation:

- Install as you would any other third party non-Android Marketplace application.

Usage:

- Either the radio log or main log or both can be collected by selecting the appropriate option.
- Output file name prefix can be specified in "Log label" field.
- A timestamp is appended to each output file name, giving the time that the log collection started.
- Output files are located in /data/data/com.sierra.logs/files or on the root of the SD card, if "Save to SD card" is selected.

8.11 RIL Properties

The operation of the RIL can be modified by setting various Android properties.

8.11.1 `persist.sierra.sim_ready_delay`

During RIL initialization, after the RIL has determined that the SIM is ready, it will send a RADIO_STATE_CHANGED notification to the telephony framework, indicating that the SIM is ready. The framework usually responds by issuing a number of SIM related commands.

This property can be used to delay sending the notification that the SIM is ready, until after the modem has successfully registered. The value of the property is used to specify a timeout value in seconds. If the modem is not registered within the timeout period, then the SIM_READY notification is sent, regardless of the current registration state. Typically this value should be at least 10-15 seconds, but normally not more than 60 seconds.

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This setting can be useful for certain modems, such as the MC7750 with 1.x FW and the MC8355, where the SIM related commands sent by the framework during initialization may interface with the registration process. If this happens, then the SIM related command may hang the RIL. The RIL will then have to recover and restart the initialization process.

8.11.2 persist.sierra.block_init_reg

During system start-up, the telephony framework will send a registration command, either automatic or manual depending on what was previously selected. This is separate from the scanning and registration that the modem will do on its own when it is powered up. This initial registration command can sometimes cause problems for test equipment that is not expecting it. No problem has ever been observed on a live network with the initial registration command.

If this property is defined and has a value greater than 0, then any initial registration commands will be ignored by the RIL. The RIL will return success, but will not do anything further. Once an explicit network scan has been performed, using RIL_REQUEST_QUERY_AVAILABLE_NETWORKS, the registration commands will work as normal.

Normally, the user should not notice any difference in behaviour if this property is defined, because the modem will normally retain the last registration settings, even after a power cycle.

8.11.3 ro.sierra.voice

This property must be set to 1 in order to enable the voice related RIL commands. If this property is not set, or is set to some other value, then the voice related RIL commands will return an error.

8.11.4 persist.sierra.sim_poll_delay

In some cases, modem will return SIM_FAILURE during SIM busy. Add this property to enable extra SIM polling when modem returns SIM_FAILURE.

Android RIL will perform 10 times of retry if this property is defined. If this property set to 6, RIL will add extra 1 minute of SIM status polling.

Typical use case is MC7750 (FW3.5.10.6Z) in CDMA mode.

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8.11.5 persist.sierra.gpsxtra

Set persist.sierra.gpsxtra to 1 to enable the GPS XTRA feature for SL8092 and SL9090.

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8.12 Custom RIL Unsolicited Responses

All of the unsolicited responses use the RIL_UN SOL_OEM_HOOK_RAW unsolicited response. The response data is provided as a byte array. The contents of this byte array are described in the following sections.

8.12.1 OMA-DM Session States

The contents of the byte array are:

```
byte_array[0] = 1;  
byte_array[1] = <oma-dm session state>
```

When an OMA-DM session is in progress, or has been attempted this unsolicited response indicates the current state of the session. This response will be sent for both client and network initiated sessions. Possible values for <oma-dm session state> are:

- 0x00 - Complete, information was updated
- 0x01 - Complete, update information is unavailable
- 0x02 - Failed
- 0x03 - Retrying
- 0x04 - Connecting
- 0x05 - Connected
- 0x06 - Authenticated
- 0x07 - Mobile Directory Number (MDN) downloaded
- 0x08 - Mobile Station Identifier (MSID) downloaded
- 0x09 - PRL downloaded
- 0x0A - Mobile IP (MIP) profile downloaded

This unsolicited response only applies to MC8355 Sprint images.

8.13 Detecting LTE modems

Initial support has been added in the RIL to auto-detect LTE modems, such as the MC7700 and MC7750, and set the properties used by the telephony framework, as follows:

- MC7700 detected
 - telephony.lteOnGsmDevice=1
 - telephony.lteOnCdmaDevice=0

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- MC7750 detected
 - telephony.lteOnGsmDevice=0
 - telephony.lteOnCdmaDevice=1

If neither of these modems is detected, then both properties are set to 0.

The auto-detection is performed as early in the RIL startup as possible, in order to try to ensure that these properties are set before the corresponding Phone object is created. However, it is possible if RIL startup is delayed, that the Phone object will be created before the RIL has a chance to set these properties. This problem is still under investigation.

NOTE: the properties will not be modified by the RIL as described above, if either of the properties is already set when the RIL starts up. Thus, the above behaviour can be disabled by explicitly setting either of the properties, before the RIL starts up.