QMI RFRPE 1.1 for MPSS.DI.1.0

QMI Radio Frequency Radiated Performance Enhancement Svc Spec

80-ND600-44 A

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Revision History

Revision	Date	Description
A	Dec 2012	Initial release. Created from 80-VB816-44 A.

1 Introduction

1.1 Purpose

This specification documents Major Version 1 of the Qualcomm Messaging Interface (QMI) for Radio Frequency Radiated Performance Enhancement (QMI_RFRPE).

QMI_REFRPE provides an interface between the application and modem to set scenarios for specific networking technologies (e.g., LTE, 1X, HDR, GSM), based upon sensor data. This interface supports antenna tuning for improved performance.

1.2 Scope

This document is intended for software developers who are developing code to interact with Qualcomm MSM™ devices to provide scenario updates (based on sensor readings) via the QMI_RFRPE.

This document provides the following details about QMI_RFRPE:

- Theory of operation – Chapter 2 provides the theory of operation of QMI_RFRPE. The chapter includes messaging conventions, assigned QMI service type, fundamental service concepts, and state variables related to the service.
- Message formats, syntax, and semantics – Chapter 3 provides the specific syntax and semantics of messages included in this version of the QMI_RFRPE specification.

1.3 Conventions

Function declarations, function names, type declarations, and code samples appear in a different font. For example, `#include`.

Parameter types are indicated by arrows:

→	Designates an input parameter
←	Designates an output parameter
↔	Designates a parameter used for both input and output

1.4 References

Reference documents are listed in Table 1-1. Reference documents that are no longer applicable are deleted from this table; therefore, reference numbers might not be sequential.

Table 1-1 Reference documents and standards

Ref.	Document	
Qualcomm Technologies		
Q1	*Application Note: Software Glossary for Customers*	CL93-V3077-1
Q2	*Qualcomm MSM Interface (QMI) Architecture*	80-VB816-1

1.5 Technical Assistance

For assistance or clarification on information in this document, submit a case to Qualcomm Technologies at https://support.cdmatech.com.

If you do not have access to the CDMATech Support website, register for access or send email to support.cdmatech@qti.qualcomm.com.

1.6 Acronyms

For definitions of terms and abbreviations, refer to [Q1]. Table 1-2 lists terms that are specific to this document.

Table 1-2 Acronyms

Acronym	Definition
APP	applications processor
EFS	embedded file system
QCCI	QMI common client interface
QCSI	QMI common service interface
QMI	Qualcomm messaging interface
RFRPE	radio frequency radiated performance enhancement
TLV	type-length-value

2 Theory of Operation

2.1 Generalized QMI Service Compliance

The QMI_RFRPE service complies with the generalized QMI service specification, including the rules for messages, indications and responses, byte ordering, arbitration, constants, result, and error code values described in [Q2]. Extensions to the generalized QMI service theory of operation are noted in subsequent sections of this chapter.

2.2 RFRPE Service Type

RFRPE is assigned QMI service type 0x29.

2.3 Message Definition Template

2.3.1 Response Message Result TLV

This Type-Length-Value (TLV) is present in all Response messages defined in this document. It is not present in the Indication messages.

Name	Version introduced	Version last modified
Result Code	Corresponding command's *Version introduced*	N/A

Field	Field value	Field type	Parameter	Size (byte)	Description
Type	0x02			1	Result Code
Length	4			2	
Value	→	uint16	qmi_result	2	Result code • QMI_RESULT_SUCCESS • QMI_RESULT_FAILURE
		uint16	qmi_error	2	Error code – Possible error code values are described in the error codes section of each message definition

2.4 QMI_RFRPE Fundamental Concepts

The QMI_RFRPE service provides the information obtained from various sensors available on the phone to the RF Driver.

QMI is the communication framework between the operating system/Application Processor (APPS) and the modem. The communication block residing on the operating system side is the QMI Common Client Interface (QCCI) and the communication block on the modem side is the QMI Common Service Interface (QCSI).

Figure 2-1 illustrates the block diagram for QMI_RFRPE.

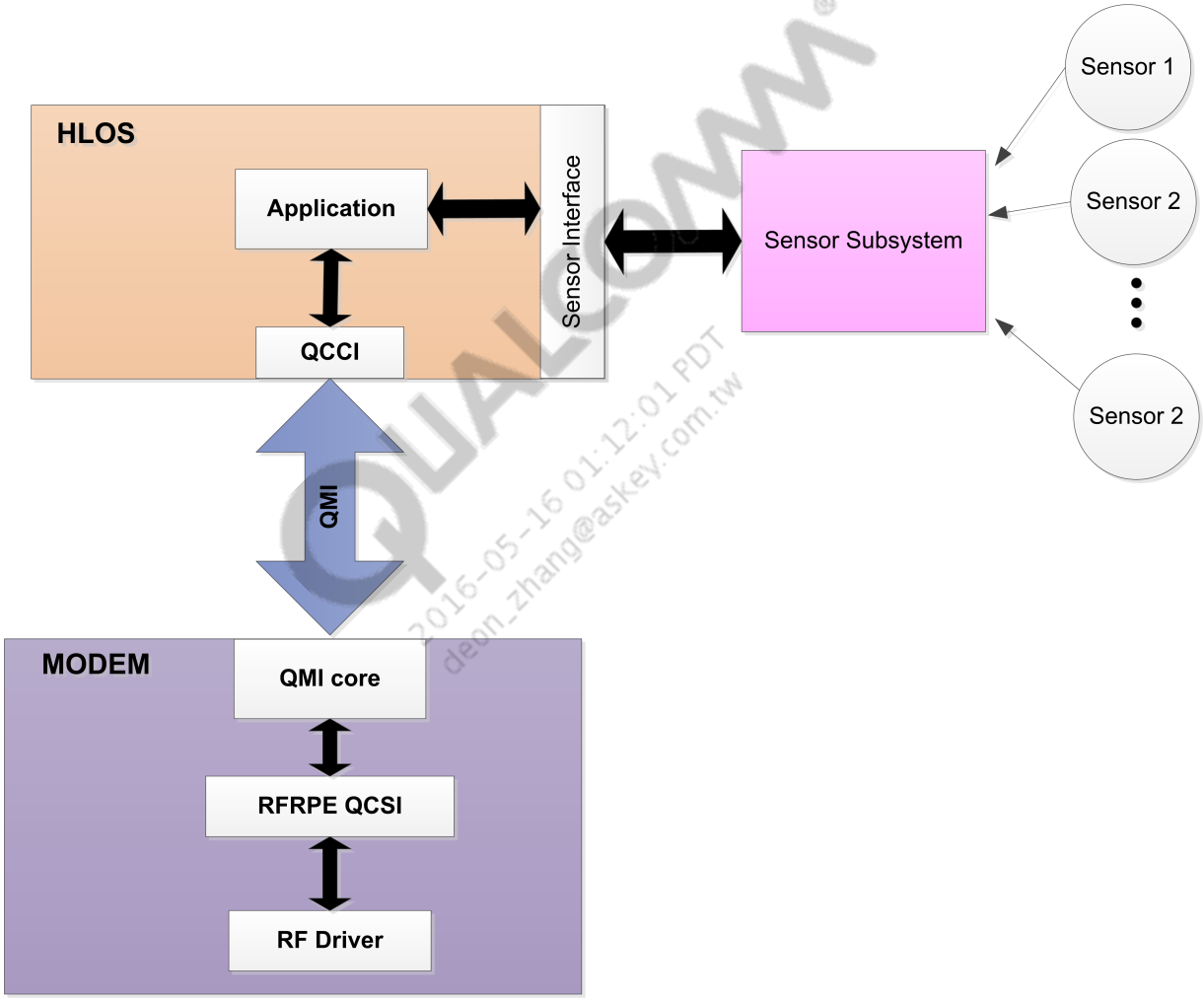

Figure 2-1 QMI_RFRPE block diagram

This interface allows an application running in any high-level operating system, like the Android™ , Windows Mobile® , or iOS® operating systems, to provide information about the phone's orientation and position based on sensor readings (e.g., gyro or proximity sensors) to the RF driver. This application consolidates the information from various sensors and maps it to a predefined scenario (commonly understood between the application and RF driver). A scenario value can range from 0 to 63. "0" is reserved as free space.

The RF driver analyzes each of the scenarios that are sent over QMI to see if it is relevant to that technology. If it is relevant, it is queued to be processed at the appropriate time. Because the scenario updates may come

at a faster speed than the RF driver can manage, the RF driver latches the scenario in a 5-deep buffer. The RF driver handler continuously monitors the traffic from the sensors and latches the current scenario. The QMI messages are only expected to come as the sensors perceive a change in conditions; however, the sensor subsystem can periodically refresh to ensure that sensor information is current.

Currently the RFRPE messages are designed and implemented to provide the following functionality for applications:

- Querying for provision information from the Modem/RF driver
- Sending scenario values, based on sensor readings
- Querying the current scenario list being used by the modem/RF driver

3 QMI_RFRPE Messages

Table 3-1 QMI_RFRPE messages

Command	ID	Description
QMI_RFRPE_SET_RFM_SCENARIO	0x0020	Provides the scenario update from the APP to the modem.
QMI_RFRPE_GET_RFM_SCENARIO	0x0021	Queries the set of scenarios that are active in the modem.
QMI_RFRPE_GET_PROVISIONED_TABLE_REVISION	0x0022	Queries the revision number of the characterization tables.

3.1 QMI_RFRPE_SET_RFM_SCENARIO

Provides the scenario update from the APP to the modem.

RFRPE message ID

0x0020

Version introduced

Major - 1, Minor - 0

3.1.1 Request - QMI_RFRPE_SET_RFM_SCENARIO_REQ

Message type

Request

Sender

Control point

Mandatory TLVs

Name	Version introduced	Version last modified
Array of Scenario Numbers from APP	1.0	1.0

Field	Field value	Field type	Parameter	Size (byte)	Description
Type	0x01			1	Array of Scenario Numbers from APP
Length	Var			2	
Value	→	uint8	scenarios_len	1	Number of sets of the following elements: • scenarios
		uint32	scenarios	Var	RFRPE scenario numbers detected in the APP.

Optional TLVs

None

3.1.2 Response - QMI_RFRPE_SET_RFM_SCENARIO_RESP

Message type

Response

Sender

Service

Mandatory TLVs

The Result Code TLV (defined in Section 2.3.1) is always present in the response.

Optional TLVs

None

Error codes

QMI_ERR_NONE	No error in the request
QMI_ERR_MALFORMED_MSG	Message was not formulated correctly by the control point or the message was corrupted during transmission
QMI_ERR_INVALID_ARG	scenario_num was not found in the characterization tables
QMI_ERR_DEVICE_NOT_READY	RF module is not in a state to process the request

3.1.3 Description of QMI_RFRPE_SET_RFM_SCENARIO REQ/RESP

This command informs the modem of a new scenario that was detected. A scenario may apply to one antenna or multiple antennas and this is reflected in the characterization table entry. As a result, multiple scenarios can be active at the same time, and some scenarios may be ignored (e.g., they only apply to an antenna that is not active).

If QMI_ERR_NONE is received, it means the modem has accepted the scenario as a recommendation to its algorithm. The modem uses the scenario numbers in a proprietary way to determine the optimal behavior based on the information in the characterization tables.

3.2 QMI_RFRPE_GET_RFM_SCENARIO

Queries the set of scenarios that are active in the modem.

RFRPE message ID

0x0021

Version introduced

Major - 1, Minor - 0

3.2.1 Request - RFRPE_GET_RFM_SCENARIO_REQ

Message type

Request

Sender

Control point

Mandatory TLVs

None

Optional TLVs

None

3.2.2 Response - QMI_RFRPE_GET_RFM_SCENARIO_RESP

Message type

Response

Sender

Service

Mandatory TLVs

The Result Code TLV (defined in Section 2.3.1) is always present in the response.

Optional TLVs

Name	Version introduced	Version last modified
List of Active Scenarios	1.0	1.0

Field	Field value	Field type	Parameter	Size (byte)	Description
Type	0x10			1	List of Active Scenarios
Length	Var			2	
Value	→	uint8	active_scenarios_len	1	Number of sets of the following elements: • active_scenarios
		uint32	active_scenarios	Var	List of active scenarios.

Error codes

QMI_ERR_NONE	No error in the request
QMI_ERR_DEVICE_NOT_READY	Device is not ready to process this request

3.2.3 Description of QMI_RFRPE_GET_RFM_SCENARIO REQ/RESP

This command queries the active scenarios. If the characterization tables are configured to have different scenarios for different antennas, multiple scenarios may be active at the same time.

3.3 QMI_RFRPE_GET_PROVISIONED_TABLE_REVISION

Queries the revision number of the characterization tables.

RFRPE message ID

0x0022

Version introduced

Major - 1, Minor - 0

3.3.1 Request - QMI_RFRPE_GET_PROVISIONED_TABLE_REVISION_-REQ

Message type

Request

Sender

Control point

Mandatory TLVs

None

Optional TLVs

None

3.3.2 Response - QMI_RFRPE_GET_PROVISIONED_TABLE_REVISION_-RESP

Message type

Response

Sender

Service

Mandatory TLVs

The Result Code TLV (defined in Section 2.3.1) is always present in the response.

Optional TLVs

Name	Version introduced	Version last modified
Revision Number of Characterization Tables	1.0	1.0
Name of OEM	1.0	1.0

Field	Field value	Field type	Parameter	Size (byte)	Description
Type	0x10			1	Revision Number of Characterization Tables
Length	4			2	
Value	→	uint32	provisioned_table_revision	4	Revision number of the characterization tables.
Type	0x11			1	Name of OEM
Length	Var			2	
Value	→	uint8	provisioned_table_OEM_len	1	Number of sets of the following elements: • provisioned_table_OEM
		uint16	provisioned_table_OEM	Var	OEM name.

Error codes

QMI_ERR_NONE	No error in the request
QMI_ERR_DEVICE_NOT_READY	Device is not ready to process this request

3.3.3 Description of QMI_RFRPE_GET_PROVISIONED_TABLE_-REVISION REQ/RESP

This command queries for the version number in the provisioned characterization tables in the modem file system (EFS tables) to verify that the version of the tables being used by the service is the one expected by the client. It is up to the OEM to ensure that it assigns unique version numbers to the tables it provisions.