QMI TIME 1.3 for MPSS.DI.1.0

QMI Time Svc Spec

80-ND600-41 A

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Revision History

Revision	Date	Description
A	Dec 2012	Initial release. Created from 80-VB816-41 A.

1 Introduction

1.1 Purpose

This specification documents Major Version 1 of the Qualcomm Messaging Interface (QMI) for TIME (QMI_TIME).

QMI_TIME provides commands related to time services.

1.2 Scope

This document is intended for QMI clients who will be performing operations related to time services for Qualcomm MSM™ devices via the QMI_TIME.

This document provides the following details about QMI_TIME:

- Theory of operation – Chapter 2 provides the theory of operation of QMI_TIME. 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_TIME 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 Reference documents that are no longer applicable are deleted from this table; therefore, reference numbers might not be sequential.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
ATS	AMSS timer service
DL	downlink (forward link)
HDR	high data rate
GMT	Greenwich mean time
QMI	Qualcomm messaging interface
RIL	radio interface layer
RTC	real-time clock
TE	test equipment
TLV	type-length-value
TOD	time of day
TZ	time zone
UTC	universal time coordinated
WCDMA	wideband code division multiple access

2 Theory of Operation

2.1 Generalized QMI Service Compliance

The QMI_TIME 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 TIME Service Type

TIME is assigned QMI service type 0x16.

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_TIME Fundamental Concepts

The QMI_TIME service provides clients commands related to time. These include the ability to set/get remote generic offset, to set/get leap second information, and to turn on/off the indications for remote updates. It is expected that user-level applications, e.g., connection managers and/or device drivers on TE, use QMI_TIME to access this functionality on the MSM device.

2.5 Service State Variables

2.5.1 Shared State Variables

No QMI_TIME state variables are shared across control points.

3 QMI_TIME Messages

Table 3-1 QMI_TIME messages

Command	ID	Description
QMI_TIME_GENOFF_SET	0x0020	Sets the generic offset specified by the base using the TIME service.
QMI_TIME_GENOFF_GET	0x0021	Retrieves the TIME service specified generic offset value.
QMI_TIME_LEAP_SEC_SET	0x0024	Sets the leap seconds on the modem.
QMI_TIME_LEAP_SEC_GET	0x0025	Retrieves the leap seconds from the modem.
QMI_TIME_TURN_OFF_IND	0x0022	Turns off the specified indication.
QMI_TIME_TURN_ON_IND	0x0023	Turns on the specified indication
QMI_TIME_UPDATE_INDICATION_ MESSAGE	–	Generic indication definition. Notifies the client of any change in time offsets on the server.

3.1 QMI_TIME_GENOFF_SET

Sets the generic offset specified by the base using the TIME service.

TIME message ID

0x0020

Version introduced

Major - 1, Minor - 0

3.1.1 Request - QMI_TIME_GENOFF_SET_REQ

Message type

Request

Sender

Control point

Mandatory TLVs

Name	Version introduced	Version last modified
Time Service Base	1.0	1.2
Offset Value	1.0	1.0

Field	Field value	Field type	Parameter	Size (byte)	Description
Type	0x01			1	Time Service Base
Length	4			2	

Field	Field value	Field type	Parameter	Size (byte)	Description
Value	→	enum	base	4	Specifies the time base to be set on the modem. Values: • TIME_SERVICE_BASE_RTC (0) – Real time clock time base. • TIME_SERVICE_BASE_TOD (1) – Proxy base for the number of bases. • TIME_SERVICE_BASE_USER (2) – User time base. • TIME_SERVICE_BASE_SECURE (3) – Secure time base. • TIME_SERVICE_BASE_DRM (4) – Digital rights management time base. • TIME_SERVICE_BASE_USER_ UTC (5) – Universal time coordinated user time base. • TIME_SERVICE_BASE_USER_ TZ_DL (6) – Global time zone user time base. • TIME_SERVICE_BASE_GPS (7) – Base for GPS time. **Note:** When TIME_SERVICE_BASE_GPS is modified, changes are also reflected on TIME_SERVICE_BASE_TOD. • TIME_SERVICE_BASE_1X (8) – Base for 1X time. **Note:** When TIME_SERVICE_BASE_1X is modified, changes are also reflected on TIME_SERVICE_BASE_TOD. • TIME_SERVICE_BASE_HDR (9) – Base for HDR time. **Note:** When TIME_SERVICE_BASE_HDR is modified, changes are also reflected on TIME_SERVICE_BASE_TOD. • TIME_SERVICE_BASE_WCDMA (10) – Base for WCDMA time. **Note:** When TIME_SERVICE_BASE_WCDMA is modified, changes are also reflected on TIME_SERVICE_BASE_TOD. • TIME_SERVICE_BASE_MFLO (11) – Base for MediaFLO time. **Note:** When TIME_SERVICE_BASE_MFLO is modified, changes are also reflected on TIME_SERVICE_BASE_TOD.
Type	0x02			1	Offset Value
Length	8			2	

Field	Field value	Field type	Parameter	Size (byte)	Description
Value	→	uint64	generic_offset	8	Offset value to set on the remote procedure. Current time = RTC value at bootup + generic offset + uptime. Therefore the generic offset = the number of ms that have elapsed from January 06, 1980 - RTC offset at bootup - uptime

Optional TLVs

None

3.1.2 Response - QMI_TIME_GENOFF_OFFSET_SET_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_INVALID_INDEX	Specified modem base was invalid

3.1.3 Description of QMI_TIME_GENOFF_SET REQ/RESP

This command sets the requested time base on the modem from applications. Applications pass in the base and the generic value offset to be set on the modem. The generic value offset is the number of milliseconds elapsed since January 6, 1980. This API does not allow the setting of the ATS_SECURE time offset on the modem. This API allows only a conditional update of the ATS_TOD offset on the modem. Setting modem system time (ATS_TOD) by an entity external to the modem can potentially cause a security issue. Therefore, the setting of ATS_TOD from applications is allowed only if ATS_TOD on the modem has not been set either by the modem or by other applications (or by another application)

3.2 QMI_TIME_GENOFF_GET

Retrieves the TIME service specified generic offset value.

TIME message ID

0x0021

Version introduced

Major - 1, Minor - 0

3.2.1 Request - QMI_TIME_GENOFF_GET_REQ

Message type

Request

Sender

Control point

Mandatory TLVs

Name	Version introduced	Version last modified
Time Service Base	1.0	1.2

Field	Field value	Field type	Parameter	Size (byte)	Description
Type	0x01			1	Time Service Base
Length	4			2	

Field	Field value	Field type	Parameter	Size (byte)	Description
Value	→	enum	base	4	Time base to be obtained from the modem. • TIME_SERVICE_BASE_RTC (0) – Real time clock time base. • TIME_SERVICE_BASE_TOD (1) – Proxy base for the number of bases. • TIME_SERVICE_BASE_USER (2) – User time base. • TIME_SERVICE_BASE_SECURE (3) – Secure time base. • TIME_SERVICE_BASE_DRM (4) – Digital rights management time base. • TIME_SERVICE_BASE_USER_ UTC (5) – Universal time coordinated user time base. • TIME_SERVICE_BASE_USER_ TZ_DL (6) – Global time zone user time base. • TIME_SERVICE_BASE_GPS (7) – Base for GPS time. **Note:** When TIME_SERVICE_BASE_GPS is modified, changes are also reflected on TIME_SERVICE_BASE_TOD. • TIME_SERVICE_BASE_1X (8) – Base for 1X time. **Note:** When TIME_SERVICE_BASE_1X is modified, changes are also reflected on TIME_SERVICE_BASE_TOD. • TIME_SERVICE_BASE_HDR (9) – Base for HDR time. **Note:** When TIME_SERVICE_BASE_HDR is modified, changes are also reflected on TIME_SERVICE_BASE_TOD. • TIME_SERVICE_BASE_WCDMA (10) – Base for WCDMA time. **Note:** When TIME_SERVICE_BASE_WCDMA is modified, changes are also reflected on TIME_SERVICE_BASE_TOD. • TIME_SERVICE_BASE_MFLO (11) – Base for MediaFLO time. **Note:** When TIME_SERVICE_BASE_MFLO is modified, changes are also reflected on TIME_SERVICE_BASE_TOD.

Optional TLVs

None

3.2.2 Response - QMI_TIME_GENOFF_OFFSET_GET_RESP

Message type

Response

Sender

Service

Mandatory TLVs

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

Name	Version introduced	Version last modified
Time Service Base	1.0	1.2
Offset Value	1.0	1.0

Field	Field value	Field type	Parameter	Size (byte)	Description
Type	0x03			1	Time Service Base
Length	4			2	

Field	Field value	Field type	Parameter	Size (byte)	Description
Value	→	enum	base	4	Time base to be obtained from the modem. • TIME_SERVICE_BASE_RTC (0) – Real time clock time base. • TIME_SERVICE_BASE_TOD (1) – Proxy base for the number of bases. • TIME_SERVICE_BASE_USER (2) – User time base. • TIME_SERVICE_BASE_SECURE (3) – Secure time base. • TIME_SERVICE_BASE_DRM (4) – Digital rights management time base. • TIME_SERVICE_BASE_USER_ UTC (5) – Universal time coordinated user time base. • TIME_SERVICE_BASE_USER_ TZ_DL (6) – Global time zone user time base. • TIME_SERVICE_BASE_GPS (7) – Base for GPS time. **Note:** When TIME_SERVICE_BASE_GPS is modified, changes are also reflected on TIME_SERVICE_BASE_TOD. • TIME_SERVICE_BASE_1X (8) – Base for 1X time. **Note:** When TIME_SERVICE_BASE_1X is modified, changes are also reflected on TIME_SERVICE_BASE_TOD. • TIME_SERVICE_BASE_HDR (9) – Base for HDR time. **Note:** When TIME_SERVICE_BASE_HDR is modified, changes are also reflected on TIME_SERVICE_BASE_TOD. • TIME_SERVICE_BASE_WCDMA (10) – Base for WCDMA time. **Note:** When TIME_SERVICE_BASE_WCDMA is modified, changes are also reflected on TIME_SERVICE_BASE_TOD. • TIME_SERVICE_BASE_MFLO (11) – Base for MediaFLO time. **Note:** When TIME_SERVICE_BASE_MFLO is modified, changes are also reflected on TIME_SERVICE_BASE_TOD.
Type	0x04			1	Offset Value
Length	8			2	

Field	Field value	Field type	Parameter	Size (byte)	Description
Value	→	uint64	generic_offset	8	Offset value to set on the remote procedure. Current time = RTC value at bootup + generic offset + uptime. Therefore the generic offset = the number of ms elapsed from January 6, 1980 - RTC offset at bootup - uptime

Optional TLVs

None

Error codes

QMI_ERR_NONE	No error in the request
QMI_ERR_INVALID_INDEX	Specified modem base was invalid

3.2.3 Description of QMI_TIME_GENOFF_GET REQ/RESP

This command returns the generic offset value on the modem for the base specified. An error is returned if the base specified is out of bounds. Note that this command returns the absolute time on the modem.

3.3 QMI_TIME_LEAP_SEC_SET

Sets the leap seconds on the modem.

TIME message ID

0x0024

Version introduced

Major - 1, Minor - 1

3.3.1 Request - QMI_TIME_LEAP_SEC_SET_REQ

Message type

Request

Sender

Control point

Mandatory TLVs

Name	Version introduced	Version last modified
Leap Seconds Set Value	1.1	1.2

Field	Field value	Field type	Parameter	Size (byte)	Description
Type	0x01			1	Leap Seconds Set Value
Length	1			2	
Value	→	uint8	leap_sec_set_value	1	Leap seconds to be set on the modem.

Optional TLVs

None

3.3.2 Response - QMI_TIME_LEAP_SEC_SET_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_NOT_SUPPORTED	Modem does not support leap second information.
QMI_ERR_NONE	No error in the request
QMI_ERR_INVALID_INDEX	Message received was null

3.3.3 Description of QMI_TIME_LEAP_SEC_SET REQ/RESP

This command sets leap seconds on the modem. Currently 1X, HDR, and GPS provide GMT time. GMT time does not take leap seconds into account. Some applications might require leap seconds. The use case scenario for leap seconds is application-specific. 3GPP radio technologies such as GSM and WCDMA do provide the leap seconds. Leap seconds, if provided, are generally decoded by the RIL on applications or the Call Manager module on the modem.

3.4 QMI_TIME_LEAP_SEC_GET

Retrieves the leap seconds from the modem.

TIME message ID

0x0025

Version introduced

Major - 1, Minor - 1

3.4.1 Request - QMI_TIME_LEAP_SEC_GET_REQ

Message type

Request

Sender

Control Point

Mandatory TLVs

None

Optional TLVs

None

3.4.2 Response - QMI_TIME_LEAP_SEC_GET_RESP

Message type

Response

Sender

Service

Mandatory TLVs

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

Name	Version introduced	Version last modified
Leap Second	1.1	1.2

Field	Field value	Field type	Parameter	Size (byte)	Description
Type	0x03			1	Leap Second
Length	1			2	

Field	Field value	Field type	Parameter	Size (byte)	Description
Value	→	uint8	leap_second	1	Leap second value to retrieve from the remote procedure.

Optional TLVs

None

Error codes

QMI_ERR_NOT_SUPPORTED	Modem does not support leap second information
QMI_ERR_NONE	No error in the request

3.4.3 Description of QMI_TIME_LEAP_SEC_GET REQ/RESP

This command retrieves the leap seconds from the modem. The leap seconds increment every few years.

3.5 QMI_TIME_TURN_OFF_IND

Turns off the specified indication.

TIME message ID

0x0022

Version introduced

Major - 1, Minor - 1

3.5.1 Request - QMI_TIME_TURN_OFF_IND_REQ

Message type

Request

Sender

Control point

Mandatory TLVs

Name	Version introduced	Version last modified
Indication To Turn Off	1.1	1.2

Field	Field value	Field type	Parameter	Size (byte)	Description
Type	0x01			1	Indication To Turn Off
Length	4			2	

Field	Field value	Field type	Parameter	Size (byte)	Description
Value	→	enum	msg_id	4	Specifies the indication to be turned off. • TIME_SERVICE_ATS_RTC_ IND_MSG (0) – Indication message for RTC offset update. • TIME_SERVICE_ATS_TOD_ IND_MSG (1) – Indication message for TOD offset update. • TIME_SERVICE_ATS_USER_ IND_MSG (2) – Indication message for USER offset update. • TIME_SERVICE_ATS_SECURE_ IND_MSG (3) – Indication message for SECURE offset update. • TIME_SERVICE_ATS_DRM_ IND_MSG (4) – Indication message for DRM offset update. • TIME_SERVICE_ATS_USER_ UTC_IND_MSG (5) – Indication message for USER_UTC offset update. • TIME_SERVICE_ATS_USER_ TZ_DL_IND_MSG (6) – Indication message for USER_TZ_DL offset update. • TIME_SERVICE_ATS_GPS_ IND_MSG (7) – Indication message for GPS offset update. • TIME_SERVICE_ATS_1X_IND_ MSG (8) – Indication message for 1X offset update. • TIME_SERVICE_ATS_HDR_ IND_MSG (9) – Indication message for HDR offset update. • TIME_SERVICE_ATS_WCDMA_ IND_MSG (10) – Indication message for WCDMA offset update. • TIME_SERVICE_ATS_MFLO_ IND_MSG (11) – Indication message for MFLO offset update. • TIME_SERVICE_ATS_3GPP_ IND_MSG (12) – Indication message for 3GPP offset update.

Optional TLVs

None

3.5.2 Response - QMI_TIME_TURN_OFF_IND_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	Indication is successfully turned off
QMI_ERR_NOT_SUPPORTED	A null request message was received or the indication to be turned off was not supported

3.5.3 Description of QMI_TIME_TURN_OFF_IND REQ/RESP

This command turns off the specified indication messages to be sent to the peripheral processor. This capability is used by the peripheral processors in case they do not want any notifications from the modem waking them up due to power constraints.

3.6 QMI_TIME_TURN_ON_IND

Turns on the specified indication

TIME message ID

0x0023

Version introduced

Major - 1, Minor - 1

3.6.1 Request - QMI_TIME_TURN_ON_IND_REQ

Message type

Request

Sender

Control point

Mandatory TLVs

Name	Version introduced	Version last modified
Indication To Turn On	1.1	1.2

Field	Field value	Field type	Parameter	Size (byte)	Description
Type	0x01			1	Indication To Turn On
Length	4			2	

Field	Field value	Field type	Parameter	Size (byte)	Description
Value	→	enum	msg_id	4	Specifies the indication to turn on. • TIME_SERVICE_ATS_RTC_ IND_MSG (0) – Indication message for RTC offset update. • TIME_SERVICE_ATS_TOD_ IND_MSG (1) – Indication message for TOD offset update. • TIME_SERVICE_ATS_USER_ IND_MSG (2) – Indication message for USER offset update. • TIME_SERVICE_ATS_SECURE_ IND_MSG (3) – Indication message for SECURE offset update. • TIME_SERVICE_ATS_DRM_ IND_MSG (4) – Indication message for DRM offset update. • TIME_SERVICE_ATS_USER_ UTC_IND_MSG (5) – Indication message for USER_UTC offset update. • TIME_SERVICE_ATS_USER_ TZ_DL_IND_MSG (6) – Indication message for USER_TZ_DL offset update. • TIME_SERVICE_ATS_GPS_ IND_MSG (7) – Indication message for GPS offset update. • TIME_SERVICE_ATS_1X_IND_ MSG (8) – Indication message for 1X offset update. • TIME_SERVICE_ATS_HDR_ IND_MSG (9) – Indication message for HDR offset update. • TIME_SERVICE_ATS_WCDMA_ IND_MSG (10) – Indication message for WCDMA offset update. • TIME_SERVICE_ATS_MFLO_ IND_MSG (11) – Indication message for MFLO offset update. • TIME_SERVICE_ATS_3GPP_ IND_MSG (12) – Indication message for 3GPP offset update.

Optional TLVs

None

3.6.2 Response - QMI_TIME_TURN_ON_IND_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	Indication is successfully turned on
QMI_ERR_NOT_SUPPORTED	Failure if a null request message was received or if the indication to be turned on was not supported or not turned off

3.6.3 Description of QMI_TIME_TURN_ON_IND REQ/RESP

This command turns on the specified indication messages to be sent to the peripheral processor. This capability is used by peripheral procedures to turn on the indications that were switched off while going into Power Saving mode.

3.7 QMI_TIME_UPDATE_INDICATION_MESSAGE

Generic indication definition. Notifies the client of any change in time offsets on the server.

TIME message ID

0x0000

Version introduced

Major - 1, Minor - 0

3.7.1 Indication - QMI_TIME_UPDATE_INDICATION_MESSAGE

Message type

Indication

Sender

Service

Mandatory TLVs

Name	Version introduced	Version last modified
Time Service Base	1.0	1.2
Offset	1.0	1.0

Field	Field value	Field type	Parameter	Size (byte)	Description
Type	0x01			1	Time Service Base
Length	4			2	

Field	Field value	Field type	Parameter	Size (byte)	Description
Value	→	enum	base	4	Specifies the time base for which the indication is to be sent. • TIME_SERVICE_BASE_RTC (0) – Real time clock time base. • TIME_SERVICE_BASE_TOD (1) – Proxy base for the number of bases. • TIME_SERVICE_BASE_USER (2) – User time base. • TIME_SERVICE_BASE_SECURE (3) – Secure time base. • TIME_SERVICE_BASE_DRM (4) – Digital rights management time base. • TIME_SERVICE_BASE_USER_ UTC (5) – Universal time coordinated user time base. • TIME_SERVICE_BASE_USER_ TZ_DL (6) – Global time zone user time base. • TIME_SERVICE_BASE_GPS (7) – Base for GPS time. **Note:** When TIME_SERVICE_BASE_GPS is modified, changes are also reflected on TIME_SERVICE_BASE_TOD. • TIME_SERVICE_BASE_1X (8) – Base for 1X time. **Note:** When TIME_SERVICE_BASE_1X is modified, changes are also reflected on TIME_SERVICE_BASE_TOD. • TIME_SERVICE_BASE_HDR (9) – Base for HDR time. **Note:** When TIME_SERVICE_BASE_HDR is modified, changes are also reflected on TIME_SERVICE_BASE_TOD. • TIME_SERVICE_BASE_WCDMA (10) – Base for WCDMA time. **Note:** When TIME_SERVICE_BASE_WCDMA is modified, changes are also reflected on TIME_SERVICE_BASE_TOD. • TIME_SERVICE_BASE_MFLO (11) – Base for MediaFLO time. **Note:** When TIME_SERVICE_BASE_MFLO is modified, changes are also reflected on TIME_SERVICE_BASE_TOD.
Type	0x02			1	Offset
Length	8			2	

Field	Field value	Field type	Parameter	Size (byte)	Description
Value	→	uint64	offset	8	Offset value to send to the remote procedure. Number of ms elapsed from January 6, 1980.

Optional TLVs

None

Error codes

QMI_ERR_NONE	No error in the request
QMI_ERR_INTERNAL	Unexpected error occurred during processing
QMI_ERR_MALFORMED_MSG	Message was not formulated correctly by the control point or the message was corrupted during transmission

3.7.2 Description of QMI_TIME_UPDATE_INDICATION_MESSAGE

This generic indication message is sent from the server to the client when time offset values on the server change. The indication message contains the time offset enum and the value of the time offset.