

HUAWEI Module

CMUX Application Guide

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About This Document

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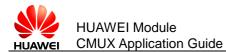
Scope

Huawei Module	Firmware Version
MU509-b	13.815.07.00.00 or latter
MU709s-2	11.651.66.01.00 or latter
MU709s-6	11.651.66.01.00 or latter
ME209u-526	11.535.11.00.00 or latter
ME909s-821	11.613.01.00.00 or latter
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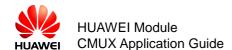
This document provides readers with necessary information to develop a multiplexing protocol running on their equipment in order to use the CMUX function provided by Huawei modules.

1.1 Audience

This guide is intended for users or integrators interested to implement a multiplexing protocol running on Huawei module.

1.2 Related Documents

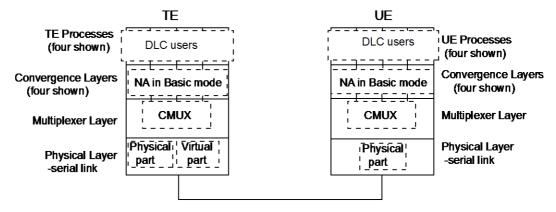
3GPP TS 27.010 V11.0.0 (2012-09), Release 11



2 Overview

CMUX Library (also referred as CMUX module) is an implementation of the standard 3GPP TS 27.010 V11.0.0 (2012-09). CMUX module along with a serial port emulation module helps providing service to several applications to use their own respective virtual ports, but in essence all data will converge and be transmitted over only one physical serial port. This is very useful in scenarios where there are several applications which intend to use more than one serial port interface, such as SMS, GPRS, voice and GSM, while only one physical port is available to communicate with the Target-platform.

Figure 2-1 General architecture



As shown in Figure 2-1, CMUX library provides facility for several serial transmissions between TE (the host) and UE (the target) over a single start-stop framed and serial link.

2.1 Implementation Features

Huawei CMUX implementation features currently support the following:

- Operating option: Basic mode
- SABM, DISC, MSC, FCON, FCOFF, DLCPN, TEST_CMD, CLD and UIH frames are supported
- DLCI 0 is control Data Link Connection Identifier (DLCI).



- The MU509-b, MU709s series, ME209u-526 and ME909s series module support four DLCIs (DLCI 1, DLCI 2, DLCI 3 and DLCI 4), and all four DLCIs are AT DLCIs. Only the ME909s series module supports DLCI 5 for eCall AT command.
- User configurable MUX settings
- DLCI PN can be sent but it is not user configurable.

2.2 Key Highlights of Huawei CMUX Application

- **Detailed Log Window:** Log window of the application provides details of the control frames sent and received in Hex and ASCII format and user understandable format leading to:
 - Easier debugging and implementation
 - Easier understanding of CMUX protocol
- Quick & Advanced DLCI Creation: DLCI creation can be quickly done through normal DLCI window. Also, application also provides flexibility to send the desired control frames and create DLCI.
- **Configurable MUX Parameters:** MUX parameters such as baud rate, response timer (T2) and retransmission number (N2) can be configured by the user.
 - Baud rates supported are 3000000 bit/s, 1000000 bit/s, 921600 bit/s, 460800 bit/s, 230400 bit/s, 115200 bit/s, 57600 bit/s, 38400 bit/s, 19200 bit/s and 9600 bit/s (The 921600 bit/s and 460800 bit/s are for MU509-b, MU709s series and ME209u-526 module; the 3000000 bit/s and 1000000 bit/s are only for ME909s series module).
 - Response time can be 100 ms to 2.5s. Default value is 900 ms.
 - The stepping time for the response time is 1 ms.
 - Retransmission number can be 0 to 10. Default value is 3.





This chapter introduces the CMUX protocol and its frame structures.

3.1 CMUX Frames Structures

All the information transmitted between the Huawei module and applications is based on frames that have the following structure.

Flag	Address	Control	Length Indicator	Information	FCS	Flag					
1 octet	1 octet	1 octet	1 or 2 octet	Unspecified length but integral number of octets	1 octet	1 octet					
•	MAX FRAME LENGTH										

Figure 3-1 Frame structure for basic option

MAX FRAME LENGTH supported is 1540.

The frame structure is composed of an opening and a closing flag, an Address field, a Control field, an Information field and Frame Check Sequence (FCS) field. A length indication field is present in each frame if no transparency mechanism is used for the multiplexing session.

3.1.1 Flag Field

Each frame begins and ends with a flag sequence octet which is defined as a constant bit pattern (0xF9 in Hexadecimal format).

3.1.2 Address Field

The address field consists of a single octet. It contains EA bit, C/R bit and DLCI as shown in Table 3-1 .



Table 3-1 Format of Address Field

KIT NO	1	2	3	4	5	6	7	8
	EA	C/R	DLCI					

- **EA:** It refers extension field. The range of the address field may be extended by use of the EA bit.
 - When the EA bit is set to 1 in an octet, it signifies that this octet is the last octet of the address field.
 - When the EA bit is set to 0, it signifies that another octet of the address field follows.
- **C/R:** It is a command or a response bit. It is used to identify whether a frame is a command or a response. If the application or module sends a command, C/R bit is set to 1; and in case of response, the C/R bit is set to 0. In Huawei CMUX implementation, the initiator is always the application. The table below summarizes the concept.

Initiator	Direction	Responder	C/R value	Command/Response
Application	\rightarrow	Module	1	Command
Application	\leftarrow	Module	0	Response
Application	\leftarrow	Module	1	Command
Application	\rightarrow	Module	0	Response

 DLCI: Data Link Connection Identifier. It is used to identify an individual user information stream as well as to identify connections between TE (the host) and UE (the target). Multiple DLCIs shall be supported but the number is implementation-specific.

3.1.3 Control Field

The content of the control field defines the type of frame. The control fields of the frames used are described in the table below.

Frame	Control	Control Octet										
Туре	1	2	3	4	5	6	7	8				
SABM	1	1	1	1	P/F	1	0	0				
UA	1	1	0	0	P/F	1	1	0				
DM	1	1	1	1	P/F	0	0	0				
DISC	1	1	0	0	P/F	0	1	0				
UIH	1	1	1	1	P/F	1	1	1				

• **P/F** stands for Poll/Final bit.



• SABM (Set Asynchronous Balance Mode)

SABM command shall be send by the TE (the host) to the UE (the target) to confirm the acceptance of SABM by transmission of UA response.

• UA (Unnumbered Acknowledge)

The UA response is sent by the module as an acknowledgement that a SABM or DISC command was accepted.

• DM (Disconnected Mode)

In case if the module rejects SABM or DISC command, it will send DM response. For example, if SABM is sent for a DLCI not supported or if a DISC is sent to DLCI address already closed, this frame will be send.

• DISC (Disconnect)

The DISC is used to close a previously established connection. If the application sends a DISC for the DLCI 1 and DLCI 1 is already established, then it will be closed. The module will answer to this command with an UA frame.

• UIH (Unnumbered Information with Header check)

The UIH command/response will be used to send information. For the UIH frame, the FCS will be calculated over only the address, control and length fields. There is no specified response to the UIH command/response.

UI (Unnumbered Information)

The UI command/response will be used to send information. There is no specified response to the UI command/response. For the UI frame, the FCS shall be calculated over all fields (Address, Control, Length Indicator, and Information). Support of UI frames is optional.

3.1.4 Information Field

The information field is the payload of the frame and carries the user data and any convergence layer information. The field is octet structured .The information field is present in UIH frames. The P/F bit should be set to 0 when this field is sent.

3.1.5 Length Indicator

This field is present only in basic option. It has the following format.

Bit No	1	2	3	4	5	6	7	8
	E/A	L1	L2	L3	L4	L5	L6	L7

Table 3-2 First byte of length field

The L1 to L7 bits indicate the length of the following data field. The default length is 31 bytes.

According to the rule of ISO/IEC 13239, the range of the length field may be extended by use of the EA bit. When the EA bit is set to 1 in an octet, it is signifies that this octet is the last octet of the length field. When the EA bit is set to 0, it signifies that a second octet of the length field follows. The total length of the length field is in that case 15 bits, L1 to L15.



The second octet of the length field (only present when the EA field in the first byte is set to 0) format is shown in Table 3-3.

		,	,					
Bit No.	1	2	3	4	5	6	7	8
	L8	L9	L10	L11	L12	L13	L14	L15

Table 3-3 Second byte of length field	Table 3-3	Second b	ovte of	lenath	field
---------------------------------------	-----------	----------	---------	--------	-------

The length field shall always be present, even if the data field is empty.

3.1.6 Frame Check Sequence

The FCS is calculated over the entire frame, but excluding the flags. Only in case of UIH frame, the FCS will not be calculated over the information field. The FCS is the ones complement of the sum (modulo 2) of the remainder of $x^k (x7 + x6 + x5 + x4 + x3 + x2 + x1 + 1)$ divided (modulo 2) by the generator polynomial x8 + x2 + x + 1, where k is the number of bits in the frame.

3.2 UIH Control Channel Frame Coding

Flag	Address	Control	Length Ir	ndicato	or	Inforr	nation	FCS	Flag
1 octet	1 octet	1 octet					ified length but number of octets	1 octet	1 octet
					/				
				T	уре		Length Indicator	Value	
				EA	C/R	TYPE	1 octet or 2 octet	N octets	
		Ē	0 1 A C/R	2	3	4 TYPE	5 6 7		

Figure 3-2 Detailed figure of information field

Type Octet:

EA: Extension bit. It is always set to 1.

C/R: Identifies whether it is a command or response.

TYPE: Hereafter are listed the UIH Command TYPES.

3.2.1 Multiplexer Close Down

The Multiplexer Close Down (CLD) command is used to reset the link into normal AT command mode without multiplexing.

The multiplexer close down message uses the following type field octet.



Bit No.	1	2	3	4	5	6	7	8
	EA	C/R	0	0	0	0	1	1

The length byte contains the value 0 and there are no value octets.

3.2.2 DLCI Parameter Negotiation

These services are used to negotiate and set parameters for a specific DLCI. This procedure is optional. If this command is not supported, default values are applied to each DLCI.

The DLCI parameter negotiation uses the following type field octet.

Bit No.	1	2	3	4	5	6	7	8
	EA	C/R	0	0	0	0	0	1

3.2.3 Non Supported Command Response (NSC)

This response is sent whenever a command type is not supported by the receiving entity. The length byte contains the value 1 and there is one value octets.

The type field octet has the following format.

Bit No.	1	2	3	4	5	6	7	8
	EA	C/R	0	0	1	0	0	0

The value octet contains the command type of the non-supported command.

The value octet has the following format.

Bit No.	1	2	3	4	5	6	7	8
	EA	C/R	Commar	nd type				

The C/R bit (in the value octet above) shall be set to the same value as the C/R bit in the type field octet of the not supported command frame

3.2.4 Modem Status Command (MSC)

This command shall be sent prior to any user data after a creation of a DLCI. This command is only relevant when the basic option is chosen.

Command	Length	DLCI	V2.4 Signal	Break Signals (optional)
---------	--------	------	-------------	--------------------------

The length byte contains the value 2 or 3 and there are 2 or 3 value octets.



The command field octet has the following format.

Bit No.	1	2	3	4	5	6	7	8
	EA	C/R	0	0	0	1	1	1

The DLCI field identifies the specific DLCI to which the command applies. Bit 2 is always set to 1 and the EA bit is set.

Bit No.	1	2	3	4	5	6	7	8
	EA	1	DLCI					

The DLCI field is followed by the control signals field which contains a representation of the state of the signals.

Bit No.	1	2	3	4	5	6	7	8
	EA	FC	RTC	RTR	Reserved 0	Reserved 0	IC	DV

Description of the control signal byte:

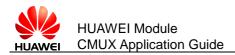
- **Bit 1**: The EA bit is set to 1 in the last octet of the sequence; in other octets, EA is set to 0. If only one octet is transmitted, EA is set to 1.
- **Bit 2**: Flow Control (FC). The bit is set to 1 (one) when the device is unable to accept frames.
- **Bit 3**: Ready To Communicate (RTC). The bit is set to 1 when the device is ready to communicate.
- **Bit 4**: Ready To Receive (RTR). The bit is set to 1 when the device is ready to receive data.
- Bit 5: Reserved for future use. Set to zero by the sender, ignored by the receiver.
- **Bit 6**: Reserved for future use. Set to zero by the sender, ignored by the receiver.
- Bit 7: Incoming call indicator (IC). The bit is set to 1 to indicate an incoming call.
- Bit 8: Data Valid (DV). The bit is set to 1 to indicate that valid data is being sent.

3.2.5 Flow Control On Command (FCon)

The flow control command is used to handle the aggregate flow. When either entity is able to receive new information, it transmits this command.

The type field octet has the following format.

Bit No.	1	2	3	4	5	6	7	8
	EA	C/R	0	0	0	1	0	1



3.2.6 Flow Control Off Command (FCoff)

The flow control command is used to handle the aggregate flow. When either entity is not able to receive information, it transmits the FCoff command. The opposite entity is not allowed to transmit frames except on the control channel (DLCI=0).

The type field octet has the following format.

Bit No	. 1	2	3	4	5	6	7	8
	EA	C/R	0	0	0	1	1	0

3.2.7 Power Saving Command (PSC)

The power saving control messages use the following type field octet.

Bit No.	1	2	3	4	5	6	7	8
	EA	C/R	0	0	0	0	1	0

If a station wants to enter a low-power state, it transmits a power saving control command; the other station replies with a power saving control response.

3.2.8 Service Negotiation Command (SNC)

This command is used to query and set a specific service on a specific DLCI. It is for instance used to set specific digital voice types.

In some situations, it is not very suitable to mix AT commands and raw data on the same DLCI. For those situations, special DLCIs can be established and converted to carry a specific data type. Examples of situation where this is especially useful is for voice transportation, where the AT commands controlling the connection (for instance for multiparty) are transported on one DLCI and voice data carried by another DLCI. If this command is not used, the DLCI is by default set to normal AT command mode. If this command is used, the DLCI indicated in the DLCI octet, is converted to carry the specific data type.

The service negotiation messages use the following format.

Bit No.	1	2	3	4	5
	Type field code	Length	DLCI	Service value octet (optional)	Voice codec Value octet (optional)



3.3 UIH Data Channel Frame Coding

Refer to Figure 3-2 and the figure below. The information field is payload of the frame and carries the user data. The information field exists only for UIH frame type. The P/F bit should be set to value 0 when this field is sent.

Flag	Address	Control	Length Indicator	Information	FCS	Flag
1 octet	1 octet	1 octet	1 octet or 2 octet	Unspecified length but integral number of octets	1 octet	1 octet
				User Data		
				N octets		

As already discussed Length Indicator specifies the length of Information field. The information field consists of the user data. The number of octets occupied is specified by the Length indicator.



4 CMUX Functional Description

Target Side Host Side PPP QT GUI DLC CONTROL COM CONTROL PORT MANAGEMENT AT HANDLER AT HANDLER AT HANDLER AT * • COM3 COM4 COM5 COM1 COM2 COM6 DIC DLC1 DLC2 DLC3 DLC4 **CMUX LIBRARY** CMUX LIBRARY Physical Port

This chapter provides the user with functionality details of CMUX.

The host side consists of Huawei CMUX application (QT GUI) and CMUX library. QT GUI consists of mainly 2 modules. They are:

- COM Control helps to create or delete the virtual COM ports.
- DLCI Control helps to keep track which DLCI is mapping to virtual COM port, and DLCI deletion can be done.

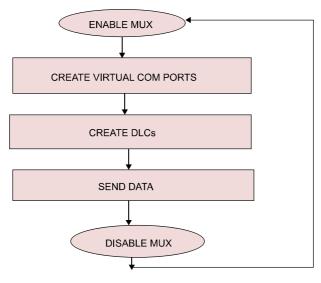
Target side also consists of CMUX library. Here DLCIs 1, 2, 3, 4 are mapped to AT command handler. PPP (Dial up) can be activated on any DLCI. The host and the target are connected through the serial cable.

• Once CMUX is enabled, control DLCI (DLC0) can be created; virtual COM ports are created and are mapped to DLCIs; DLCI creation can be done.



• Once DLCI data channel is established, users can transfer the data through either from transfer window in QT GUI or through other applications such as hyper terminal.





4.1 Establish CMUX Session

- Step 1 First of all, the user application (the host) must force the connected module in multiplexed mode which is done by sending AT+CMUX command and the target (Huawei board) responds with OK.
- Step 2 Secondly SABM frame is sent for DLC0 by the host and the target responds with UA frame informing the user that the DLCI is established.
- Step 3 DLC0 (control channel) is the first channel established at the initiation of the multiplexer between the TE (the host) and UE (the target) and it has the DLCI value 0.

4.2 Create Virtual COM Port

Virtual COM ports can be created from the Huawei CMUX application and map the virtual COM port (not in use) to the specific DLCI (not established) for DLCI creation.

4.3 Create DLCI

Establishment of a DLCI will be initiated by the TE (the host). TE (the host) wishing to establish a DLCI transmits an SABM frame with the P-bit set to 1. The address field contains the DLCI value associated with the desired connection.

If UE (the target) is ready to establish the connection, it will reply with a UA frame with the F-bit set to 1.



• If UE (the target) is not ready or unwilling to establish the particular DLCI, it responds with a DM frame.

4.4 Send Data

Huawei CMUX data channels (DLCIs) shall be used to transmit user data streams (UIH data) such as AT command data and GPRS data etc., and data channels shall be established only once after control channel (DLCI 0) is established.

4.5 Disable MUX

The release of DLCI will be initiated from TE (the host) by the transmission of a DISC frame with P-bit set to 1.Confirmation of the DLCI release is signaled by UE (the target) sending a UA response frame with F-bit set to 1. Once the DLCI has been released, UE (the target) enters into disconnected mode for that particular DLCI. If UE (the target) receives the DISC command and is already in a disconnected mode, it will send the DM frame to the TE.

нс	OST			TA	RGET	
	AT+CMUX=0) <cr></cr>				
			OK <cr><l< td=""><td>.F></td><td></td><td></td></l<></cr>	.F>		
USER APPLICATION MU	ST SUPPORT N	IULTIPLEXED M	10DE		 MODUI	LE IS IN MULTIPLEXED MODE
	4		UA DLC0			
	DLC=0 DLCPN	FOR DLC1	DLC	20		
	D	LC=0 DLCPN re	sponse for D	LC1		
	SABM DLC1					
			UA DLC1	F		
	DISC DLC1					
			UA DLC1	-		
	CLD DLC0					
	4	CLD RES	PONSE DLC	20		
					MUX m	node disabled

Figure 4-2 CMUX Protocol

The table below summarizes the procedure in enabling MUX, creating DLCIs and sending data.



In the following tables, messages in **Red** are sent from TE (the host) to UE (the target); and messages in **Blue** are sent from UE (the target) to TE (the host).

PROCEDURE	FRAMES
Start or Enable MUX	AT+CMUX 0,0,5,31,10,3,30,10,1
	ОК
	SABM, DLCI 0
	UA, DLCI 0
Create virtual COM ports	None
Map COM port to DLCI	DLCI_PN_CMD, DLCI 1
	DLCI_PN_RESP, DLCI 1
	SABM, DLCI 1
	UA, DLCI 1
Send data	UIH_DATA, DLCI 1
	UIH_DATA (with response), DLC1
Disable MUX	DISC, DLCI 1 (say only DLCI 1 is established)
	UA, DLCI 1
	CLD_CMD , DLCI 0
	CLD_RESP, DLCI 0

Table 4-1 Procedure and frames during various MUX operations

The frames and the actual frame formats (as hexadecimal) during various CMUX operations are shown as below:

	Flag	Address	Control	Length Indicator	Information	FCS	Flag
SABM, DLCI 0	F9	03	3F	01	-	1C	F9
UA, DLCI 0	F9	03	73	01	-	D7	F9
DLCI_PN_CMD,					83 11 01 00		
DLCI1	F9	03	FF	15	01 0A 1F 00	FB	F9
					03 02		
DLCI_PN_RESP,					81 11 01 00		
DLCI 1	F9	03	FF	15	01 0A 1F 00	FB	F9
					03 02		
SABM, DLCI 1	F9	07	3F	01	-	DE	F9



	Flag	Address	Control	Length Indicator	Information	FCS	Flag
UA, DLCI 1	F9	07	73	01	-	15	F9
FCON CMD, DLC0	F9	03	EF	05	A3	F2	F9
	19	03		05	01	12	19
FCON_REP, DLC0	F9	03	FF	A1	01	E7	F9
	19	03	11	05	01		19
FCOFF_CMD, DLC0	F9	03	EF	05	63 01	F2	F9
FCOFF_RESP, DLC0	F9	03	FF	05	C1 01	E7	F9
MSC_CMD, DLCI 1 (XON)	F9	03	EF	09	E3 05 07 0D	FB	F9
MSC_RESP, DLC1 (XON)	F9	03	FF	09	E1 05 07 0D	EE	F9
MSC_CMD, DLCI 1 (XOFF)	F9	03	EF	09	E3 05 07 0F	FB	F9
MSC_RESP, DLC1 (XOFF)	F9	03	FF	09	E1 05 07 0F	EE	F9
DISC, DLC1	F9	07	53	01	-	3F	F9
UA, DLC1	F9	07	73	01	-	15	F9
CLD_CMD, DLC0	F9	03	FF	05	C3 01	E7	F9
CLD_RESP, DLC0	F9	03	FF	05	C1 01	E7	F9



5 Installation Procedures and Requirements

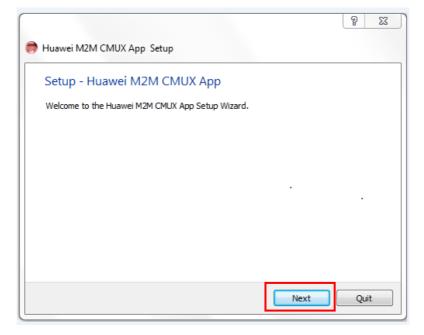
5.1 Install HuaweiCMUXInstaller

The following steps describe how to install the Huawei M2M CMUX Application.

Step 1 Double click the HuaweiCMUXInstaller.exe.



Step 2 The setup welcome window will be dispalyed, and click Next.





Step 3 Give the installed path and click **Next**.

	8	23
🅞 👼 Huawei M2M CMUX App Setup		
Installation Folder		
Please specify the folder where Huawei M2M CMUX App will be installed.	_	
C:\Users\p84016010\Huawei\HuaweiM2MCMUXApp	Brows	se
	_	
Next	Can	cel

Step 4 CMUX Componets List window will be displayed, and click Next.

		9	23
🚱 🌎 Huawei M2M CMUX App Setup			
CMUX Components List			
The following components are going to be installed.			
✓ Com0com 3.0.0.0✓ Qt Application			
Default			
	Next	Car	ncel

Step 5 Choose I accept the licenses and click Next.



🌀 🌻 Huawei M2M CMUX App Se	tup		
License Agreement			
Please read the following license agree agreements before continuing with the	ements. You must accept the terms containe e installation.	ed in t	hese
GNU General Public License	GNU GENERAL PUBLIC LICEN	NSE	
Huawei Standard License	Version 3, 29 June 2007		
	Copyright (C) 2007 Free Software Found Inc. <http: fsf.org=""></http:> Everyone is permitted to copy and distril verbatim copies of this license document, but changing it allowed.	ibute	
	Broomblo		-
 I accept the licenses. I do not accept the licenses. 	(#00000		
	Next	Cano	el

Step 6 **Huawei M2M CMUX App** is the default folder name where the shortcut for the Huawei CMUX Application is created and click **Next**.

	ବୃ	23
🈋 👼 Huawei M2M CMUX App Setup		
Start Menu shortcuts		
Select the Start Menu in which you would like to create the program's shortcut enter a name to create a new folder.	ts. You d	an also
Huawei M2M CMUX App		
Accessories Administrative Tools com0com		*
Huawei M2M CMUX App Maintenance Notepad++		H
Source Insight 3 Startup		
Subversion		*
Next	Car	ncel

Step 7 Click **Instal** to begin installing the Huawei CMUX application.



	ବ	23
G 🌻 Huawei M2M CMUX App Setup		
Ready to Install		
Setup is now ready to begin installing Huawei M2M CMUX App on your computer.		
Show Details		
Install	Can	icel

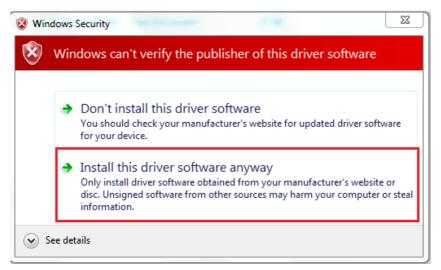
	? ×
🕞 🌻 Huawei M2M CMUX App Setup	
Installing Huawei M2M CMUX App	
	50%
Installing component Qt Application	
Show Details	
Install	Cancel

Step 8 After the **Huawei M2M CMUX Application** is completed, click **Finish** to exit the installation wizard.

	ବୃ	23
👼 Huawei M2M CMUX App Setup		
Completing the Huawei M2M CMUX App Wizard		
Click Finish to exit the Huawei M2M CMUX App Wizard.		
	Fin	ish

5.2 Create Virtual COM Ports

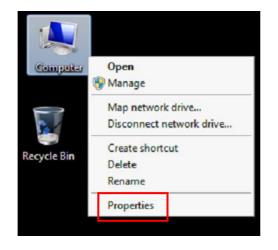
While creating virtual COM ports through the application for the first time, the following window may appear many times. Select **Install this driver software anyway**.



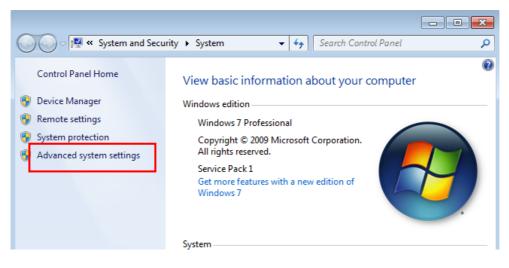
The following steps show how to increase virtual COM ports creation speed through the application.

Step 1 Select **Properties** of My Computer.





Step 2 Select Advanced System Settings, and System Properties window will be displayed.



Step 3 Select Hardware > Device Installation Settings, and click OK.



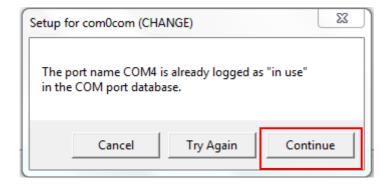
stem Properties				23
Computer Name	Hardware	Advanced	System Protection	Remote
on y	- Device Mar	er. Use the D	the hardware device evice Manager to ch Device Manag	ange the
	ose whether	Windows do	wnloads driver softw ion about them.	
			Device Installation	Settings
		ОК	Cancel	Apply

Step 4 Select **No, let me choose what to do**, **Install diver software...** and click **Save Changes**. Restart your system to apply the settings as shown in figure below to avoid COM creation delay.

C	Device Installation Settings
	Do you want Windows to download driver software and realistic icons for your devices?
	Ves, do this automatically (recommended)
	No, let me choose what to do
	Always install the best driver software from Windows Update.
	Install driver software from Windows Update if it is not found on my computer.
	 Never install driver software from Windows Update.
	Replace generic device icons with enhanced icons
	Why should I have Windows do this automatically?
	Save Changes Cancel

• Sometimes, the following window appears while creating virtual COM ports using application even if COM port is not there in system. Click **Continue** to continue with COM port creation.

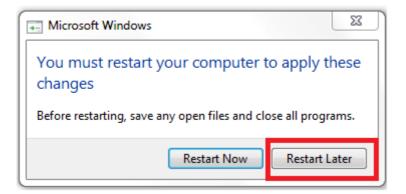




• While closing the application, sometimes the following message box may appear. Click **Continue**.

Setup for com0com (UPDATE)	×
Can't stop device root\com0com \Device Close application that use this device and Or Continue and then reboot system.	
Cancel Iry Again	Continue

• While creating virtual COM ports through the application, restart message as shown below may come. Select **Restart later**.





6 Guide of Huawei CMUX Application

The CMUX application developed by Huawei is used on PC channels existing at the same time on one physical line (serial port). These virtual channels can be used by different PC applications.

After installing Huawei CMUX application on Windows 7 PC, you can click CMUX application shortcut or select it from menu.

6.1 CMUX Application Main Window

Figure 6-1 is the main window in the application from which all the features can be accessed like setting the CMUX parameters, enabling MUX and DLCI creation etc.

II Huawei-CMUX		
Baud Rate 115200 V CLOSE FCOFF T2	256 N2 3 90 UI	HELP
DLC Advanced AT/Raw Statistics		
Image: All image: DLC0 image: DLC1 image: DLC2 image: DLC3 image: DLC4 DLC DIRECTION HEX FRAME	CLEAR ASCII FRAME DESCRIPTION	SAVE TIME
]

Figure 6-1 Huawei CMUX App Main Window



6.1.1 N1, N2 and T2

The maximum frame size (N1) can vary from 31 bytes to 1540 bytes. By default it is 256 bytes. The maximum number of retransmission (N2) can vary from 0 to 10. The default value is 3. The response timer (T2) can vary from 10 ms to 250 ms. The default value is 90 ms.

Huawei-CMUX	- 0 X
CMUX COM COM1 OPEN FCON N1 256 N2 3 Baud Rate 115200 ▼ CLOSE FCOFF Status T2 90 UI □	HELP
DLC Advanced AT/Raw Statistics	
Add Virtual Port	SAVE
DLC DIRECTION HEX FRAME ASCII FRAME DESCRIPTION	TIME
۲. III.	4

6.1.2 Baud Rates

In the main window, there is a combo box for the baud rates. Baud rates supported are 3000000 bit/s, 1000000 bit/s, 921600 bit/s, 460800 bit/s, 230400 bit/s, 115200 bit/s, 57600 bit/s, 38400 bit/s, 19200 bit/s and 9600 bit/s (**The 921600 bit/s and 460800 bit/s are for MU509-b, MU709s series and ME209u-526 module; the 3000000 bit/s and 1000000 bit/s are only for ME909s series module**). The default value is 115200 bit/s.

I Huawei-CMUX	
CMUX COM COM1 ▼ OPEN FCON N1 256 N2 Status Status T2 90 UI Status Status T2 90 UI Status Status T2 90 UI Status Stat	HELP
Add Virtual P 57600 38400 19200 9600	
All DLC0 DLC1 DLC2 DLC3 DLC4	CLEAR SAVE
DLC DIRECTION HEX FRAME ASCII FRAME DES	SCRIPTION TIME



6.1.3 Help Button

After clicking the **HELP**, the **About Huawei CMUX App** window will open which contain the details about the application.

Huawei-CMUX					
	OPEN FCON CLOSE FCOFF	Status :	1 256 2 90	N2 3 UI	HELP
	About Huawei Cmu	іх Арр			<u> </u>
Add Virtual Port	Warning:This app treaties.No part o	olication is protec of this software m	Host 02.22.16 fechnologies Co. Ltd ed by copyright laws a ay be reproduced or tra onsent of Huawei Techr	nsmitted in any for	
🛛 Ali 🔲 DLC0 [OK
DLC D	DIRECTION HI	EX FRAME	SCII FRAME DESC	RIPTION T	IME

6.1.4 Enable and Disable MUX

CMUX configuration widget has options to enable and disable MUX as well as has options to send flow control commands. MUX can be enabled on physical port only. To enable the MUX, the user can select the physical comport from the COM combo box at a specific baud rate and set the MUX parameters and then click on **OPEN**, the MUX will get enabled.

сом со	M1 POPE	EN FCON	Status ·	MUX ENABLED		256	N2	3		HELP	ר
Baud Rate 11	5200 👻 🔂	DSE FCOFF	56665 .	HOX ENABLED	Т2	90	UI [11221	_
DLC Advan	iced AT/Ra	w Statistics									
dd Wateral Dart											
dd Virtual Port											
V Ali 🔲 DLG	20 🔲 DLC1	DLC2	DLC3 🔲 (DLC4			[CLEAR	2	SAVE	
DLC	DIRECTION	1	I	HEX FRAME			(SAVE	
	DIRECTION	1 10 21		HEX FRAME			[CLEAR			[
DLC	DIRECTION	1		HEX FRAME			(c ~

• On clicking the **FCON**, the data frames can be sent and received between both TE (the host) and UE (the target).



Huawei-CMU	х											23
CMUX COM CC Baud Rate 11	0M1 ▼ 0PE	_		Status :	FCON	N1 2 T2 9	N2 UI	-		HE	LP]
DLC Adva	nced AT/Rav	v Stati	stics									
Add Virtual Port	.]											
V All DL	.C0 🔲 DLC1	DLC2		C3 🔲 I	DLC4				CLEAR		SAVE	
DLC	.C0 DLC1		DL4		DLC4 HEX FI	RAME			CLEAR		SAVE ASC	- -
DLC	DIRECTION			1	HEX FI				CLEAR		_	-
DLC	DIRECTION - Out	_	EF 05	5 A3	HEX FI	F9		-	CLEAR) <u> </u>	_	

• On clicking the **FCOFF**, the data frames cannot be received between the targets.

Huawei-CMU	X					
CMUX COM CO Baud Rate 1: DLC Adva	15200 - CL	OSE FCOFF	tatus : FCOFF	N1 256 T2 90	N2 3 UI	HELP
Add Virtual Port						
Add Virtual For	U					
	U					
	e					
			3 🔲 DLC4		CLE	AR SAVE
		DLC2 DLC	3 DLC4	RAME	CLEA	AR SAVE
	.C0 🔲 DLC1					
	.C0 DLC1 DIRECTIO	N	HEX FI	13		ASC ^
	.C0 DLC1 DIRECTIO	LA OT FL OD	HEX FI AI 01 93 63 01 F2	r9 F9		AS(^

• On clicking the **CLOSE**, the MUX will get disabled.



CMUX											
		FCON	Chatha		DISABLED	N1	256	N2	3		HELP
Baud Rate 115200		FCOFF	Statu	S: MUXI	DISABLED	T2	90	UI			HELP
DLC Advanced	AT/Raw	Statistics									
Add Virtual Port											
Ali DLCO	DLC1 DL	C2 🔲 D	LC3	DLC4					CLEA	2	SAVE
		C2 🔲 D	LC3		FDAME				CLEA	٩ [
	IRECTION				FRAME				CLEA	2	SAVE
DTC0 OR	IRECTION		UD	HEX	17 19				CLEA	2	
DTC0 OR	IRECTION	US EE	UD	HEX	17 19				CLEA	2	

6.2 DLCI Main Window

DLCI tab has options to create and delete the virtual ports as well can send the modem status command for the particular DLCIs.

CMUX COM COM1 • •	N2 3 HELP	x
DLC Advanced AT/Raw Statistics Add Virtual Port		
V AII DLC0 DLC1 DLC2 DLC3 DLC4	CLEAR SAVE	
DLC DIRECTION HEX FRAME	1	A2 *
DLC DIRECTION HEX FRAME	1	
DLC DIRECTION HEX FRAME	1	
DLC DIRECTION HEX FRAME	1	

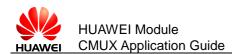
• On clicking the Add Virtual Port, the virtual ports will get added to the window.



Huawei-CMUX CMUX COM COM1 OPEN FCON N1 256	N2 3
Baud Rate 115200 CLOSE FCOFF Status : MUX ENABLED T2 90	UI
DLC Advanced AT/Raw Statistics	
Delete Virtual Port COMIS 1 V SINC AT V SEND	Create XCON Status : Delete XCOFF
AI DLCO DLC1 DLC2 DLC3 DLC4	CLEAR SAVE
DLC DIRECTION HEX FRAME	ASCII FRAME
14 DLCO In F9 03 73 01 D7 F9	
15	

- **Create** is used for creating the DLCIs.

Huawei-CMUX	
CMUX COM COM1 OPEN FCON N1 256 N2 3 Baud Rate 115200 CLOSE FCOFF Flow Contr Hardwa Status N1 256 N2 3	HELP
DLC Advanced AT/Raw Statistics	
Add Virtual Port	
1 Delete Virtual Por COM4 1 VCON	Status
VAll DLC0 DLC1 DL2 DLC3 DLC4	SAVE
DLC DIRECTION 5 IEX FRAME ASCII FRAME DESCRIPTION TIME	
6	
8	



Huawei-CMU)	K								
CMUX COM CO Baud Rate 115	M1 - OPEN	FCON S	Status : MUX ENABLED		256 90		N2 3 UI 🔲		HELP
DLC Advan	ced AT/Raw	Statistics							
Delete Virtua	al Port COM15	1 -	SNC AT	SEND	Create Delete		Status :	DLC 1 created	I, mapped to COM15
			3 🔲 DLC4					CLEAR	SAVE
🗸 Ali 📃 DLO	0 DLC1	DLC2 DLC							
DLC	DIRECTION		HEX FRAME				ASCII FR	AME	^
	DIRECTION		HEX FRAME			.?	ASCII FR	AME	SAI
DLC	DIRECTION	UJ UZ UF F	HEX FRAME			.?	ASCII FR	AME	
DLC 18 DLC1	DIRECTION	03 02 0F F F9 07 3F 0	HEX FRAME				ASCII FR	AME	SAI

 The Add Virtual Port can add only 4 DLCIs at a time. If it is clicked four more or than four times, it will give an error message as Cannot create more than 4 DLCIs.

CMUX					
COM COM1 ▼ OPEN Baud Rate 115200 ▼ CLOSE	ECON FCOFF Status : MUX ENABLED		V1 256 72 90	N2 3 UI	HELP
DLC Advanced AT/Raw	Statistics				
Add Virtual Port Delete Virtual Port COM15	1 ▼ SNC AT ▼	SEND Create Delete	XCON Status : XCOFF	DLC 1 created, mapped to (COM15
Delete Virtual Port COM16	2 v SNC AT v	Error	tus :	DLC 2 created, mapped to (COM16
Delete Virtual Port COM17	3 - SNC AT -	8		DLC 3 created, mapped to (COM17
Delete Virtual Port COM18	4 - SNC AT -	SEND Create Delete	XCON Status : XCOFF	DLC 4 created, mapped to (COM18
🗸 All 📄 DLC0 📄 DLC1 📄 D	DLC2 🔲 DLC3 🔲 DLC4				CLEAR SAVE
DLC DIRECTION	HEX FRAME		ASCII FR	AME	DE: '
27 - In 0	F9 01 EF 15 81 11 03 00 03 02 8F F9	01 0A 1F 00			DLC_PN_RESP, DLC
•	m				4

• On clicking **XCON**, the data frames can be sent and received by the host and target for the particular DLCI. In this example, this modem status command (**XCON**) will take place for DLC1.



Huawei-CMUX		
CMUX COM1 OPEN ECON. Baud Rate 115200 CLOSE. FCOFF Status : MUX ENABLED	N1 256 N2 3 T2 90 UI	HELP
DLC Advanced AT/Raw Statistics		
Add Virtual Port Delete Virtual Port COM15 1 > SNC AT (SEND Create XCON Status Delete XCOFF	:: XCON
All DLC0 DLC1 DLC2 DLC3 DLC4	CLEAR	SAVE
DLC DIRECTION HEX FRAME	ASCII H	TRAME ^
45 DLCO Out F9 03 EF 09 E3 05 07 0D 46 - In	FB F9	-
< III		4

- **Delete** is used to delete the mapped DLCI.

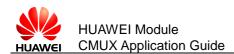
Huawei-CMUX				
CMUX COM1 OPEN FCC Baud Rate 115200 CLOSE FCC	Status : MUX ENABLED	N1 256 T2 90	N2 3 UI	HELP
DLC Advanced AT/Raw Stati	istics			
Delete Virtual Port COM15 1	• SNC AT •	SEND	elete XCOFF	Status : DLC 1 not created
V AI DLC0 DLC1 DLC2	DLC3 DLC4			CLEAR SAVE
DLC DIRECTION	HEX FRAME			ASCII FRAME
	7 73 01 15 F9			
49			-	······································

6.3 Advanced Main Window

Advanced tab is used to send the control frames.

6.3.1 Create DLCI from Advanced Window

Step 1 Select SABM from Frame Type combo box.



Huawei-CMUX									
CMUX COM COM1 Baud Rate 115200	=	FCON	Status : MUX ENABLED	N1 T2	256 90	N2 3 UI		HE	ELP
DLC Advanced	AT/Raw	Statistics							
Frame Type SABM SABM CTRL		LC 1	▼ COM1 ▼	Send			STATUS		
Frame PSC_	CMD PN_CMD								
DLC_ Frame PSC_	_CMD _PN_CMD _CMD _CMD	DLC2 🔲 DL	C3 🔲 DLC4				CLE	AR	SAVE
Frame DLC PSC_ TEST	_CMD _PN_CMD _CMD _CMD	DLC2 🔲 DL	C3 🗇 DLC4 HEX FRAME				CLE ASCII F		SAVE
Frame DLC PSC_ TEST	CMD PN_CMD CMD CMD CMD DLC1	DLC2 🔲 DL F9 07 73 (HEX FRAME						
Frame DLC PSC_ TEST	CMD PN_CMD CMD CMD CMD DLC1		HEX FRAME						

Step 2 Select DLCI number (say 1) from the **DLC** Identifier combo box and virtual COM port (say **COM15**) from **COM** combo box. **STATUS** will show whether the DLCI is already mapped to another COM or vice versa.

Huawei-CMUX	
CMUX COM COM1 ▼ OPEN FCON Baud Rate 115200 ▼ CLOSE FCOFF Flow Contr Hardwa ▼ Status T2 90	HELP
DLC Advanced AT/Raw Statistics	
Frame Type SABM V DLC 1 V COM1 V Send	STATUS
Frame 2 3 4 5	
	CLEAR SAVE
DLC DIRECTI	N TIME



Huawei-CMUX						
COM COM1 - OPEN FCON		N1 2	56	N2 3		
Baud Rate 115200 V CLOSE FCOFF	tatus : MUX ENABLED	T2 9	D	UI 📄		HELP
DLC Advanced AT/Raw Statistics						
Frame Type SABM	COM1 COM1 COM3 COM12 COM13 COM14 COM15	Send			STATUS	
All DLC0 DLC1 DLC2 DLC	3 🔲 DLC4				CLEAR	SAVE
DLC DIRECTION	HEX FRAME				ASCII FRAME	· · · · · ·
48 DLC1 In F9 07 73 02 49 - - -	L 15 F9		s.			
<						Þ

Step 3 Select **Send** to send the frame.

Now DLCI creation is done. If the DLCI is already created, sending SABM will fail.

luawei-CMU	x									0 2
MUX COM CC Paud Rate 11	M1 V OPEN	Sta	tus : MUX ENA	BLED	256 290	N2 UI			Н	ELP
DLC Advar	nced AT/Raw	Statistics								
Frame Type	ABM 🔻	DLC 1	COM15 -	Send			STATUS	SABM send	successfully	on DLC 1
Frame				:	SABM on DLC1					
	C0 🔲 DLC1 [DLC2 DLC3	DLC4		SABM on DLC1			CLEA	R	SAVE
	CO DLC1 [DLC4 HEX FR		SABM on DLC1		ASCII FF		R	SAVE
🗸 Ali 📄 DLi					SABM on DLC1		ASCII FF		R	
Ali DL	DIRECTION	7 F9 07 3F 01	HEX FR				ASCII FF		R	
All DLC	DIRECTION	7 F9 07 3F 01	HEX FR		?		ASCII FR		R	SA

6.3.2 Delete DLCI from Advanced Window

- Step 1 Select CTRL_DISC from the Frame Type combo box.
- Step 2 Select **DLCI** number (say 1) from the **DLC** Identifier combo box and corresponding virtual COM port from **COM** combo box.
- Step 3 Click **Send** to send the frame.

This will delete the created DLCI. If the DLCI that is to be deleted is not created, then an error message will come.



Huawei-CMUX	:)
MUX COM COT	M1 V OPEN	FCON			N1 256		N2 3			_		
Baud Rate 115	200 - CLOSE	FCOFF	Status : MUX I	ENABLED	T2 90		UI				HELP	
DLC Advan	ced AT/Raw	Statistics										
Frame Type	TRL_DISC 🔻	DLC 1	COM15	▼ Sen	d			STATUS	DISC send	success	fully on D	LC 1
Frame					CTRL_DISC	on DLC1						
Frame					CTRL_DISC	on DLC1						
	0 🗍 DLC1 🗍	DLC2 DLC2	.C3 🔲 DLC4		CTRL_DISC	on DLC1			CLE	AR	SAV	Έ
	0 DLC1 DIRECTION			FRAME	CTRL_DISC	on DLC1	AS	SCII FR		AR	SAV	_
🖉 Ali 📄 DLC	DIRECTION		HEX	FRAME	CTRL_DISC	on DLC1	AS	CII FR		AR		_
All DLC	DIRECTION Out		HEX 01 3F F9	FRAME	CTRL_DISC		AS	SCII FR		AR		-
All DLC DLC 65 DLC1	DIRECTION Out	F9 07 53	HEX 01 3F F9	FRAME	CTRL_DISC	5.?	AS	CII FR		AR		DI

6.3.3 Send Test Commands from Advanced Window

- Step 1 Select **TEST_CMD** from the **Frame Type** combo box.
- Step 2 Enter the message to be send.
- Step 3 Click **Send** to send the frame.

If data length is less than 127, then data length must be less than frame length (N1) -2 and if the data length is greater than 127, then data length must be less than frame length (N1) -3.

This will send the message. If the user tries to send empty message or the message size greater than the maximum frame size (**N1**), then an error message will come.

	FCON FCOFF	FD. N1	256 N2	
Baud Rate 115200 - CLOSE		Т2		HELP
DLC Advanced AT/Raw	Statistics			
Frame Type TEST_CMD DL	C 1 • COM15 •	Send hello	STATU	S Test Command Sent Successfully on DLCO
Frame		TEST_CMC	0 on DLC0	
All DLC0 DLC1 D	DLC2 DLC3 DLC4			CLEAR SAVE
DLC DIRECTION	HEX FRAM	E _	ASCII FRAME	DLC 1 DOWN (Se
	79 03 EF 0F 23 0B 68 6 79	5 6C 6C 6F 1F	#.hello	TEST_CMD, DLC
	79 01 EF 0F 21 0B 68 63 79	5 6C 6C 6F 7E	!.hello~	TEST_RESP, DLC
•	III			Þ



6.3.4 Close down the CMUX from Advanced Window

- Step 1 Select CLD_CMD from the Frame Type combo box .
- Step 2 Click **Send** to send the frame.

This will disable the CMUX.

_	11 • OPEN		tus : MUX DISABLED		N1 256	N2 3	HELP
aud Rate 115	200 V CLOSE	FCOFF			T2 90	UI 🔲	
Advanc	ed AT/Daw	Statistics					
Frame Type CL	D_CMD V	LC 1 •	COM15 🔻	Send hello		STATUS Close	e down command sent successfully on DL
Frame					CLD_CMD on DLC0		
	0 🔲 DLC1 🔲	DLC2 🔲 DLC3	DLC4				CLEAR SAVE
Ali 📄 DLCi	DIRECTION		HEX FRAME		ASCII	FRAME	DESCRIP
V All DLC		E0 02 EE 05	C3 01 F2 F9				CLD_CMD, DLC 0
	Out	19 03 EF 03					CLD_RESP, DLC 0
DLC			C1 01 93 F9				
DLC 70 DLC0	In		C1 01 93 F9		-		DLC 0 DOWN

6.4 AT/Raw Main Window

AT/Raw tab is used to send the AT commands in ASCII and Hex format for a particular DLCI.

- Step 1 Select the created DLCI on which you want to send the AT commands.
- Step 2 Select the AT commands from the **AT** combo box.

New AT commands can be added in the **AT** combo box through the line edit by clicking **Insert**.

Step 3 Click **Send** to send the AT command.

We can also send the AT commands in **Ascii** and **HEX** form by selecting the Radio box and then click **Send** to send the command.

The Insert is used to insert the new AT commands in the AT combo box.

The **Delete** is used to delete the existing AT commands present in the AT combo box.



Huawei-CMUX		
CMUX COM COM1 V OFEN FCON Baud Rate 115200 V CLOSE FCOFF Status : MUX ENABLED	N1 256 T2 90	N2 3 HELP
DLC Advanced AT/Raw Statistics	Send Delete	Insert
DLC1 V		Asci Send Hex
V AI DLCO DLC1 DLC2 DLC3 DLC4		CLEAR SAVE
DLC DIRECTION HEX FRAME	ASCII FRAME	DESCRIPTION
79 DLC1 Out F9 07 3F 01 DE F9	?	SABM, DLC 1
80 DLC1 In F9 07 73 01 15 F9		UA, DLC 1
81	-	DLC 1 UP
<		۱

6.5 Statistics Application Main Window

Statistics tab is used to show the created DLCI with the time duration when it is created.

Baud Rate		Status : MUX I	ENABLED N1 256 T2 90	N2 3 UI	HELP
	DLC TXSpeed	RXSpeed	Total Transmitted	Total Received	Time
1 1	0	0	4	9	11:55:19
2 2	0	0	0	0	12:02:00
3 3	0	0	0	0	12:02:01
4 4	0	0	0	0	12:02:01
✓ All DL 87 DLC0	Out F9 0		FRAME 03 00 01 0A 11	CLE/	AR SAVE ASCII

6.6 Log Window

Log window shows frames sent by the host (TE) and the target (UE) in Both Hex and ASCII format with the time duration. There are checkboxes for DLCIs, if the user wants to see only the frames sent on DLCI 0 then by checking DLCI 0, the user can see the frames sent on DLCI 0 only. It is the same with DLC1, DLC2, DLC3, and



DLC4. If the user wants to see all the frames sent then by checking the ALL checkbox, the user can see all the frames. The log window can also be saved and cleared by clicking the **SAVE** and **CLEAR** respectively.

Huawei-CMU)					
CMUX COM CO Baud Rate 111 DLC Advan	200 - CLOSE	FCON FCOFF Status	s : MUX DISABLED		N2 3 HELP
DLC	TXSpe	ed RXSpe	ed Total Transmitted Total Reco	eived Time	
🗸 Ali 📄 DLO	0 🗖 DLC1 🗖	DLC2 DLC3	DLC4		CLEAR SAVE
DLC	DIRECTION		HEX FRAME	ASCII FRAME	DESCRI
1 -	In	-		-	0,1 OK
2 DLCO	Out	F9 03 3F 01	1C F9	?	SABM, DLC 0
	In	F9 03 73 01	D7 F9		
3 DLCO		15 05 75 01			UA, DLC 0
3 DLC0 4 -	-	-		-	UA, DLC 0 DLC 0 UP
			A3 01 F2 F9	-	
4 -	-	-		-	DLC 0 UP
4 - 5 DLC0	- Out	- F9 03 EF 05	A1 01 93 F9	-	DLC 0 UP FCON_CMD, DLC 0
4 - 5 DLC0 6 -	- Out In	- F9 03 EF 05 F9 01 EF 05	Al 01 93 F9 63 01 F2 F9	-	DLC 0 UP FCON_CMD, DLC 0 FCON_RESP, DLC 0
4 - 5 DLC0 6 - 7 DLC0	- Out In Out In	- F9 03 EF 05 F9 01 EF 05 F9 03 EF 05	A1 01 93 F9 63 01 F2 F9 61 01 93 F9	- 	DLC 0 UP FCON_CMD, DLC 0 FCON_RESP, DLC 0 FCOFF_CMD, DLC 0
4 - 5 DLCO 6 - 7 DLCO 8 -	- Out In Out In	- F9 03 EF 05 F9 01 EF 05 F9 03 EF 05 F9 01 EF 05	A1 01 93 F9 63 01 F2 F9 61 01 93 F9 C3 01 F2 F9	- 	DLC 0 UP FCON_CMD, DLC 0 FCON_RESP, DLC 0 FCOFF_CMD, DLC 0 FCOFF_RESP, DLC 0
4 - 5 DLCO 6 - 7 DLCO 8 - 9 DLCO	- Out In Out In Out	- F9 03 EF 05 F9 01 EF 05 F9 03 EF 05 F9 01 EF 05 F9 03 EF 05	A1 01 93 F9 63 01 F2 F9 61 01 93 F9 C3 01 F2 F9	- 	DLC 0 UP FCON_CMD, DLC 0 FCON_RESP, DLC 0 FCOFF_CMD, DLC 0 FCOFF_RESP, DLC 0 CLD_CMD, DLC 0



7 How to Use Windows Dialer

The following steps describe how to create dialer in windows (to use the virtual port as the modem port) for M2M project.

7.1 Create the Virtual Ports

- Step 1 Create the virtual ports using Com0com software.
- Step 2 In Start menu dialog box, input phone and modem.

Control Panel (1)			-
Phone and Modem			
			. 15
See more results			
phone and modem	×	Shut down 🕨	
3			

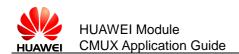
Step 3 Click Modems tag and then click Add.



Phone and Modem	×		
Dialing Rules Modems Advanced			
The following modems are installed:			
Modem	Attached To		
HUAWEI Mobile Connect - 3G Modem	Not present		
HUAWEI Mobile Connect - 3G Modem #2 HUAWEI Mobile Connect - 3G Modem #3 HUAWEI Mobile Connect - 3G Modem #3 HUAWEI Mobile Connect - 3G Modem	Not present COM14 COM13		
🛞 Add 🔞 Re	emove Properties		
ОК	Cancel Apply		

Step 4 Select the mark option and then click **Next**.

Add Hardware Wizard	
Install New Modem Do you want Windo	ows to detect your modem?
	 Windows will now try to detect your modem. Before continuing, you should: 1. If the modem is attached to your computer, make sure it is turned on. 2. Quit any programs that may be using the modem. Click Next when you are ready to continue. Iv Don't detect my modem; I will select it from a list.
	< Back Next > Cancel



Step 5 Wait till it retrieves all the available configurations, and then select the type of the modern and click **Next**.

Add Hardware Wizard	
instali New Modem	
Select the manufacturer and an installation disk, click Hav	l model of your modem. If your modem is not listed, or if you have ve Disk.
Manufacturer (Standard Modem Types) HUAWEI Technologies Co.,LTD	Models Standard 19200 bps Modem Standard 28800 bps Modem Standard 33600 bps Modem Standard 56000 bps Modem Standard 56000 bps Modem
This driver is digitally signed. <u>Tell me why driver signing is imp</u>	Have Disk Cancel

Step 6 Select the modem port on which the modem has to be configured. And click **Next**.

Add Hardware Wizar	lem (s) you want to install the modem on. You have selected the following modem:
	Standard 33600 bps Modem On which ports do you want to install it? C. All ports Image: Selected ports COM1 COM3 COM12 COM16 COM17 COM18
	< Back Next > Cancel

Step 7 Final page of configuration, click **Finish** to create new modem.



Add Hardware Wizard Install New Modem Modem installation is fi	nished!
	Your modem has been set up successfully.
	If you want to change these settings, double-click the Phone and Modem Options icon in Control Panel, click the Modems tab, select this modem, and then click Properties.
	< Back Finish Cancel

Step 8 Change the **Properties** of the modem.

Phone and Modem			
Dialing Rules Modems Advanced			
The following modems are installed:			
Modem	Attached To		
HUAWEI Mobile Connect - 3G Modem HUAWEI Mobile Connect - 3G Modem #2 HUAWEI Mobile Connect - 3G Modem #3 Standard 33600 bps Modem	Not present Not present Not present COM13		
Standard 33600 bps Modern #2	COM16		
	Duplicate Remove View log		
	Properties		
	Copy properties Apply properties		
Remove Properties			
ОК	Cancel Apply		

Step 9 Configure the speed of the modem to **115200**. And click **OK**.



I Standard 33600 bps Modem #2 Properties
General Modem Diagnostics Advanced Driver Details
Port: COM16
Speaker volume
Low High
Maximum Port Speed
115200 -
300
2400 Dial Cont 4800
19200
38400 57600
115200
OK Cancel

Step 10 Click Advanced tag and choose Flow control in Data Connection Preferences as None. And click OK.

🚙 Standard 33600 bps Modem #2 Default Pre 💡 🔀
General Advanced
Call preferences
Disconnect a call if idle for more than mins
Cancel the call if not connected withinsecs
Data Connection Preferences
Port speed: 115200 -
Data Protocol:
Compression:
Flow control: Hardware
None
OK Cancel

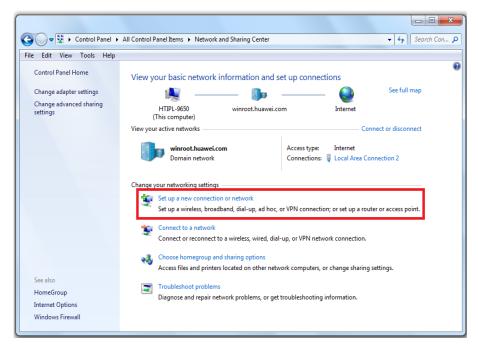
Step 11 Click **OK** on the all windows opened.



Step 12 Setup a dialer from Control Panel > Network and Internet > Network Sharing Center.

🔵 🗢 🕎 🕨 Control Panel 🕨	All Control Panel Items Network and Sharing Center	er 🗸 🎸 Search Con
Edit View Tools Help		
Control Panel Home	View your basic network information a	nd set up connections
Change adapter settings	🔍 —— 🦫	🖡 🔜 🔮 See full map
Change advanced sharing settings	HTIPL-9650 winroot.huav (This computer)	wei.com Internet
	View your active networks	Connect or disconnect
	winroot.huawei.com Domain network	Access type: Internet Connections: U Local Area Connection 2
	Change your networking settings	
	Set up a new connection or network Set up a wireless, broadband, dial-up, ad	hoc, or VPN connection; or set up a router or access point.
	🍟 Connect to a network	
	Connect or reconnect to a wireless, wired	d, dial-up, or VPN network connection.
	Choose homegroup and sharing options	
	Access files and printers located on other	r network computers, or change sharing settings.
See also	Troubleshoot problems	
HomeGroup	Diagnose and repair network problems, o	or get troubleshooting information.
Internet Options		

Step 13 Click on Set up a new connection or network.



Step 14 Click Set up a dial-up connection and click Next.

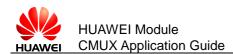


🕞 👰 Set Up a Connection or Network	
Choose a connection option	
Connect to the Internet Set up a wireless, broadband, or dial-up connection to the Internet. Set up a new network Configure a new router or access point.	
Connect to a workplace Set up a dial-up or VPN connection to your workplace.	
	Next Cancel

Step 15 Then select the created modem from the list.

Create a Dial-up Connection	
Which modem do you want to use?	
Standard 33600 bps Modem	
Standard 33600 bps Modem #2 Modem	
Help me decide	
	Cancel

Step 16 Give the **Dial-up number** as ***99#** and the dialer name of user choice, and click **Connect**.



Type the information fi	rom your Internet service provide	r (ISP)
Dial-up phone number:	*99#	Dialing Rules
User name:	[Name your ISP gave you]	
Password:	[Password your ISP gave you]	
	Show characters Remember this password	
Connection name:	cmux_dialer	
😵 🥅 Allow other people to This option allows any	use this connection yone with access to this computer to use thi	s connection.
<u>I don't have an ISP</u>		
		Connect Cance

Step 17 Now start MUX on the target. Then create the DLCI on the port where the dial has to be done.

Open the hyper terminal on that port and initialize the APN. For example, if dialing has to be done on COM2, create DLCI on the COM2, and then open COM2 in hyper terminal and initialize the APN. If Airtel SIM is in use, then give the initialize the APN for Airtel.

AT+CGDCONT=1,"IP","www.airtelgprs.com"

7.2 Disconnect the Hyper Terminal

Then disconnect the hyper terminal. Now follow the steps below.

Step 1 Select the dialer **cmux_dialer** from the toolbar. Click **Connect**.





Step 2 Select **Properties** of the dialer.

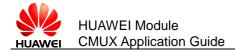
Connect c	mux_dialer
User name: Password:	
O Me or	user name and password for the following users: ily ie who uses this computer
Dial:	*99#

Step 3 Select the modem from the list (if more than one modems are configured). Click **Configure**.

cmux_dialer Properties				
General Options Security Networking Sharing				
Connect using:				
Modem - Standard 33600 bps Modem #2 (COM16) Modem - Standard 33600 bps Modem (COM13) Modem - HUAWEI Mobile Connect - 3G Modem #3 ((2 2			
All devices call the same numbers Onfigure Dial only first available device				
Phone number Area code: Phone number:				
Country/region code:				
Use dialing rules Dialing Rule	s			
See our online <u>privacy statement</u> for data collection and use information.				
ОК Са	ncel			

Step 4 Select the speed as **115200** and select the **Enable hardware flow** and click **OK**.

Networking Sharing
×
Modem #2 (COM16)
115200 🔹
1200 2400
4800
19200 38400
57600
115200 230400
460800 921600
OK Cancel
OK Cancel



Step 5 Click **OK** on the remaining windows opened.

Step 6 Click Dial.

Connecting to cmux_dialer	
N	Dialing *99#
	Cancel



8 Summary and Recommendations

The user protocol application shall remember:

 Huawei module supports the CMUX basic option and UIH frames. The serial port must be configured as: 8 data bits, no parity, 1 stop bit and no flow control.

🛄 ΝΟΤΕ

The 909s series module enables CMUX mode only when the hardware flow control is enabled. The hardware flow control is enabled with the CMUX APP.

While creating DLCIs, make sure only virtual COM ports created through the application are used. It will be useful if you make a list of virtual ports created by other applications other than the ones created by the Huawei CMUX app.

- Speeds supported are: 3000000 bit/s, 1000000 bit/s, 921600 bit/s, 460800 bit/s, 230400 bit/s, 115200 bit/s, 57600 bit/s, 38400 bit/s, 19200 bit/s and 9600 bit/s (The 921600 bit/s and 460800 bit/s are for MU509-b, MU709s series and ME209u-526 module; the 3000000 bit/s and 1000000 bit/s are only for ME909s series module).
- When an asynchronous AT command, such as AT+COPS=?, is executed in a DLC channel, AT commands executed in other DLC channels are cached. Responses to those cached commands are returned only after the response to the asynchronous AT command is returned. Each DLC channel can have only one cached AT command. (Applies to MU709 series module and ME909s series)

Speeds are supported through "IPR" setting.

Limitations:

- The UIH data cannot be shown in log window because during PPP or bulk download, it affects the CMUX performance and makes slow down.
- We cannot release the ports when It is selected to send the message since all the tabs are in the same window and we have provided option to select the VSP in 2 places in AT/RAW window. Hence until the App is closed the VSP will not get released. Only possible thing is directly send the AT command from other Tools or only send the AT commands from AT/RAW window
- The virtual ports opened in the SSCOM will always write at the speed on which the MUX is enabled.
- Suppose if the MUX is enabled with the baud rate 9600 and the virtual ports are opened at the speed of 115200, it will write at the speed of 9600 only.

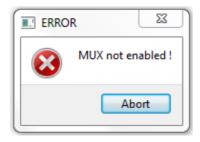


- If the data length and the data length size in the CMUX frame are in mismatch, then some of the upcoming frames might get affected (the number of frames affected depends on the frame size of the MUX session)
- CSD feature is not supported over CMUX.
- The local upgrade is not supported in the CMUX mode.(Applies to MU709 series module and ME909s series)
- The AT commands, such as: AT+IPR, AT&C, AT&D, AT&S, AT+IFC, AT+ICF, ATZ and AT&F are not effective, and they only return OK in the CMUX mode. (Applies to MU709 series module and ME909s series)

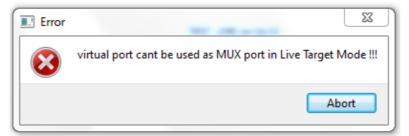


9 FAQ

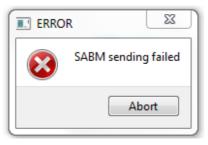
• FAQ 1: If you try to perform any operation from **Advanced** window when the MUX is not enabled, the following error message will be shown.



• FAQ 2: If MUX enabling is tried on virtual port, the following error message will be shown.

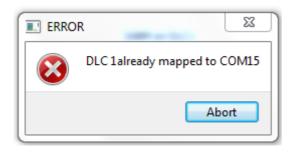


• FAQ 3: If **SABM** frame is tried to send again on an already created DLCI, the following error message will be shown.

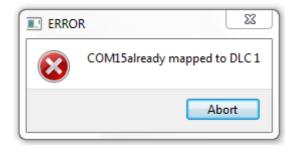




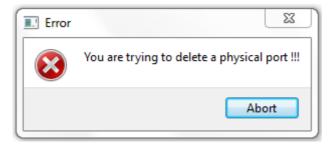
• FAQ 4: If already created DLCI is tried to be mapped to another COM, the following error message will be shown.



• FAQ 5: If already mapped COM port is tried to be mapped to another DLCI, the following error message will be shown.



• FAQ 6: If DLCI is tried to be created on a physical port, the following error message will be shown.



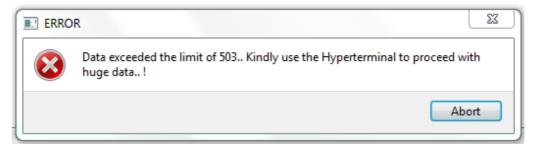
• FAQ 7: When you want to send data in Hex format, make sure you enter data in the following format as shown in this eg: A4 B3... 07 DE. Otherwise the following error message will be shown.

ERRO	R 23
	Enter proper Data !
	Abort

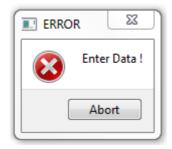
FAQ



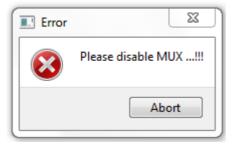
• FAQ 8: When you try to send large data through Huawei CMUX Application, the following error will be shown. In such situations, use application like hyperterminal to send large data.



• FAQ 9: When you try to perform **TEST_CMD** with no data, the following error will be shown.



• FAQ 10: When you try to close the application and the MUX is not disabled, the following error will be shown.



• FAQ 11: When you try to delete virtual COM port which is in use, restart option may come. Make sure that applications using that COM is closed before trying to delete it from Huawei CMUX Application.



10 Abbreviations

Abbreviations	Full spelling
3GPP	3rd Generation Partnership Project
CLD_CMD	Close Down Command
CLD_RESP	Close Down Response
DISC	Disconnect Command
DLCI	Data Link Connection Identifier
DLCI_PN_CMD	DLCI Parameter Negotiation Command
DLCI_PN_RESP	DLCI Parameter Negotiation Response
DM	Disconnected Mode
ERM	Error-Recovery Mode
FCS	Frame Check Sequence
MSC	Modem Status Command
NSC	Non Supported Command
PSC	Power Saving Control
SABM	Set Asynchronous Balanced Mode
TE	Terminal Equipment
TS	Technical Specification
UA	Unnumbered Acknowledgement
UE	User Equipment
UI	Unnumbered Information
UIH	Unnumbered Information with Header check