MODFLEX MINI GATEWAY ETHERNET

Host Protocol Guide

LS RESEARCH, LLC
WIRELESS PRODUCT DEVELOPMENT

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1 Introduction

1.1 Purpose & Scope

The purpose of this document is to describe in detail the message protocol used to communicate between a Host Device and the Mini Gateway Ethernet (MGE).

1.2 Applicable Documents

- *MGE Datasheet*
- *MGE User Guide*

1.3 Revision History

Date	Change Description	Revision
3/15/2012	Initial release.	1.0

Table 1 Revision History

2   Ethernet Messages

This document describes in detail the Ethernet message protocol used to communicate between a Host Device and a MGE.

2.1   Ethernet Protocol Overview

All Ethernet data sent to and from the MGE can be represented in the following packet structure.

	Header						Payload	Trailer	
Field	Preamble	Start-Of-Frame-Delimiter	MAC Destination	MAC Source	802.1Q header (optional)	EtherType	Data	CRC Checksum	Interframe Gap
# Bytes	7	1	6	6	(4)	2	46-1500 (IPv4 packet to MGE)	4	12

Table 2 802.3 MAC Frame

In the case of the MGE all 802.3 messaging is IPv4 data. This means that the EtherType field will be equal to 0x0800 and the payload data will be an IPv4 packet which is shown in Table 3.

Bit Offset	0 - 3	4 - 7	8 -15	16 - 18	19 - 31
0	Version	Header Length	Differential Services	Total Length	
32	Identification			Flags	Fragment Offset
64	Time to Live		Protocol	Header Checksum	
96	Source Address				
128	Destination Address				
160	Options (if Header Length > 5)				
160 or 192+	Data (TCP or UDP packet for MGE)				

Table 3 IPv4 Packet Structure

The IPv4 packet data will be one of two types that will carry the host protocol messages to the MGE. The MGE can receive Transmission Control Protocol (TCP) or User Datagram Protocol (UDP) packets.

Bit Offset	0 - 3	4 - 7	8 -15	16 - 31
0	Source Port			Destination Port
32	Sequence Number			
64	Acknowledgment Number			
96	Data Offset	Reserved	Flags	Window Size
128	Checksum			Urgent Point
160	Options (if Data Offset > 5) 0 – 320 bits divisible by 32			
160 to 192	Data (contains MGE host protocol messages)			

Table 4 TCP Packet Structure

Bit Offset	0 - 15	16 - 31
0	Source Port	Destination Port
32	Length	Checksum
64	Data (contains MGE host protocol messages)	

Table 5 UDP Packet Structure

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2.2 UDP Discovery Message

Each MGE device sends out a broadcast discovery message every five seconds on UDP port 23. The five second broadcast interval can be changed (see host protocol message Set Discovery Message Interval) to various intervals, but the default is five seconds. The structure of the message is shown below.

Byte	Description	Value
1	Start Byte	1
2	Packet Length	86
3	Packet Type	1
4	Board Type	1
5 – 6	Ethernet TCP Connection Port	Two byte value of the current MGE TCP connection port (MSB to LSB). Byte 5: TCP Port High Byte Byte 6: TCP Port Low Byte
7 – 8	Ethernet UDP Connection Port	Two byte value of the current MGE UDP connection port (MSB to LSB). Byte 7: UDP Port High Byte Byte 8: UDP Port Low Byte
9 – 14	MAC Address	Six byte MAC address of the MGE (MSB to LSB).
15 – 19	Firmware Version	Firmware Version number of the MGE. Byte 15: Version Major Byte 16: Version Minor Byte 17: Version Month Byte 18: Version Day Byte 19: Version Year
20 – 83	Gateway Name	64 byte ASCII name of the gateway. Note: Only 50 characters are usable.

84 – 85	Module Type	Two byte identifier for the type of RF module in the MGE.
		
		Byte 84: 0x00
		Byte 85: Module Type
		   Module type SiFLEX02 = 1
		   Module type ProFLEX01 = 2
		   Module type SiFLEX01 = 3

86	Checksum	1 byte summation of all previous bytes in the message

Table 6 MGE UDP Discovery Broadcast Message

2.3   Example Host Protocol Message Exchange

Below is an example that shows what a complete host Ethernet packet would look like for a "Query Firmware Version" and a "Respond with Firmware Version" message exchange.

```
Host->MGE Query Firmware Version 03 03 00
MGE->Host Query Firmware Version Ack 83 17 00 01 00 07 1D 0A 0E 4C 53 52 20 4D 47 45 20 41 63 74 61 6C 6C
```

Figure 1 Query Firmware Version Message and Response

Below is an example showing a "Query RF Channel" pass through message to the module on the MGE.

Host -> Module Query RF Channel 01 08 00 01 05 07 0D 04

Module -> Host Query RF Channel Ack 01 09 00 01 06 87 09 97 04

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3 Host Protocol Message Definitions

The information contained in this section is abbreviated and omits the header information which is common to all Ethernet messages.

3.1 Host Protocol Message Overview

	Header		Payload
Field	Type	Length	Data
# Bytes	1	2	n

Figure 2 Host Protocol Message Format

Field Name	Field Description
Type	The packet type byte identifies the intent of the packet.
Length	The length of the entire Ethernet message (LSB to MSB).
Data	n bytes of data which pertains to the type of the packet. The data is variable depending on the type of packet. For some packets there is no data.

Figure 3 Host Protocol Message Field Descriptions

3.2 Host Protocol Table Field Descriptions

3.2.1 Host to MGE

This field shows the message type for messages that get sent from the host device to the MGE, and are within the range of 0x01 through 0x7F.

Host to MGE	MGE to Host	Message Length	Payload Length	Payload Name	Description

Figure 4 Host to MGE

3.2.2 MGE to Host

This field shows the message type for messages that get sent from the MGE to the host device, and are within the range of 0x81 through 0xFF.

Host to MGE	MGE to Host	Message Length	Payload Length	Payload Name	Description

Figure 5 MGE to Host

3.2.3 Message Length

This column contains the length of the entire message, which consists of the header (1 byte) and payload. The minimum sized message is 1 byte and occurs in messages that contain no payload.

Host to MGE	MGE to Host	Message Length	Payload Length	Payload Name	Description

Figure 6 Message Length

3.2.4 Payload Field Length

This column lists the length in bytes of each payload field.

Host to MGE	MGE to Host	Message Length	Payload Length	Payload Name	Description

Figure 7 Payload Field Length

3.2.5 Payload Field Name

This column contains a list of the fields that are contained within each message.

Host to MGE	MGE to Host	Message Length	Payload Length	Payload Name	Description

Figure 8 Payload Field Name

3.2.6 Description

This column details what the message does or what is contained in the payload field.

Host to MGE	MGE to Host	Message Length	Payload Length	Payload Name	Description

Figure 9 Description

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3.3 Host Protocol Message Definitions

Host to MGE	MGE to Host	Message Length	Payload Length	Payload Name	Description
3.3.1 Message Pass-Through to Module – 0x01					
0x01	-	3 + n	n	Module Message	ModFLEX Module Host protocol message.
-	0x01	3 + n	n	Module Message Ack	ModFLEX Module Host protocol message response.
3.3.2 Set MAC Address – For Internal Use Only – 0x02					
0x02	-	11	1	Address to Use	0x00: Use permanent MAC Address 0x01: Use editable MAC Address
			1	Address to Set	0x00: None 0x01: Set permanent MAC Address 0x02: Set editable MAC Address
			6	MAC Address	6 byte MAC address (MSB to LSB).
-	0x82	3	0	-	Set MAC address ack.
3.3.3 Query Firmware Version – 0x03					
0x03	-	3	-		
	0x83	9 + n	1	Version Major	Version major number.
			1	Version Minor	Version minor number.
			1	Version Month	Version month (1 - 12).
			1	Version Day	Version day (1 - 31).
			1	Version Year	Version year (0 - 99).
			1	Version String Length	Length of version string (0 - 32 bytes).
			n	Version String	Version string (0 - 32 bytes in length).

Host to MGE	MGE to Host	Message Length	Payload Length	Payload Name	Description
3.3.4	**Set IP Address – 0x04**				
0x04	-	18	1	Address Mode	0x01: DHCP / AutoIP 0x02: Static IP
			4	Static IP	4 byte IP Address (LSB to MSB). This is ignored when setting DHCP Mode.
			4	Subnet Mask	4 byte Address (LSB to MSB). This is ignored when setting DHCP Mode.
			4	Default Gateway	4 byte Address (LSB to MSB). This is ignored when setting DHCP Mode.
			2	Reserved	Reserved for future use.
-	0x84	3	0	-	Set IP Address ack.
3.3.5	**Query IP Address Mode – 0x05**				
0x05	-	3	0	-	
-	0x85	18	1	Address Mode	0x01: DHCP / AutoIP 0x02: Static IP
			4	IP Address	4 byte Address (LSB to MSB).
			4	Subnet Mask	4 byte Address (LSB to MSB). This is ignored when setting DHCP Mode.
			4	Default Gateway	4 byte Address (LSB to MSB). This is ignored when setting DHCP Mode.
			2	Reserved	Reserved for future use.
3.3.6	**Set Gateway Name – 0x06**				
0x06	-	7 - 56	1	Name Length	Gateway name can be 1 – 50 bytes long.
			2	Reserved	Reserved for future use.
			1 - 50	Gateway Name	Gateway name string.
-	0x86	3	0	-	Set Gateway name ack.

Host to MGE	MGE to Host	Message Length	Payload Length	Payload Name	Description
3.3.7 Query Gateway Name – 0x07					
0x07	-	3	0	-	
-	0x87	7 - 56	1	Name Length	Gateway name can be 1 – 50 bytes long.
			2	Reserved	Reserved for future use.
			1 - 50	Gateway Name	Gateway name string.
3.3.8 Set Ethernet Connection Ports – 0x08					
0x08	-	9	2	TCP Connection Port	Two byte TCP port LSB to MSB that a host can send messages to. The default port is 48879.
			2	UDP Connection Port	Two byte UDP port LSB to MSB that a host can send messages to. The default port is 64206.
			2	Reserved	Reserved for future use.
-	0x88	3	0	-	Set Ethernet connection ports ack.
3.3.9 Query Ethernet Connection Ports – 0x09					
0x09	-	3	0	-	
-	0x89	9	2	TCP Connection Port	Two byte TCP port LSB to MSB that a host can send messages to. The default port is 48879.
			2	UDP Connection Port	Two byte UDP port LSB to MSB that a host can send messages to. The default port is 64206.
			2	Reserved	Reserved for future use.

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Host to MGE	MGE to Host	Message Length	Payload Length	Payload Name	Description
3.3.10 Set Discovery Message Interval – 0x0A					
0x0A	-	7	2	Broadcast Interval	Two byte time in milliseconds LSB to MSB. Default is 5000 (5 sec). Minimum values is 1000 (1 sec)
			1	Send Always	This byte determines if the discovery message is sent even when a host is connected. 0x00 – Don't send when a host is connected (default value) 0x01 – Send when a host is connected
			1	Reserved	Reserved for future use.
-	0x8A	3	0	-	Set broadcast discovery message interval ack.
3.3.11 Query Discovery Message Interval – 0x0B					
0x0B	-	3	0	-	
-	0x8B	7	2	Broadcast Interval	Two byte time in milliseconds (LSB to MSB).
			1	Send Always	This byte determines if the discovery message is sent even when a host is connected. 0x00 – Don't send when a host is connected (default value) 0x01 – Send when a host is connected
			1	Reserved	Reserved for future use.
3.3.12 Enable/Disable Terminal Debug Messages – For Internal Use Only – 0x0C					
0x0C	-	5	1	Options	Bit 0: Debug Messages (0 = disable messages, 1 = enable messages)
			1	Reserved	Reserved for future use.
-	0x8C	3	0	-	
3.3.13 Terminal Debug Message – For Internal Use Only – 0x8D					
NA	-	-	-	-	
-	0x8D	4 + n	1	Message Length	Length of the ASCII Message (0-255).
			n	ASCII Message	String of ASCII characters to display in terminal window.

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Host to MGE	MGE to Host	Message Length	Payload Length	Payload Name	Description
3.3.14 Reset Gateway – 0x0E					
0x0E	-	3	0	-	Reset Mini-Gateway.
-	0x8E	3	0	-	Reset Mini-Gateway ack.
3.3.15 Close Connection – 0x0F					
0x0F	-	3	0	-	This command should be issued by a host right before an Ethernet connection to an MGE is closed. This allows the MGE to know the host has closed the connection and the discovery broadcast message will be started again. This message does not need to be sent if the host is using a TCP connection. If using a UDP connection this message is **VERY IMPORTANT!**
-	-	-	0	-	
3.3.16 Set Ethernet Connection Timeout – 0x20					
0x20	-	11	4	Timeout	If there is no Ethernet traffic between the host and the MGE, this timeout dictates the amount of time the MGE waits before closing its Ethernet connect and re-enabling the discovery message broadcast so a new host can connect to it. This value is sent LSB to MSB and corresponds to a time period in milliseconds. The lowest value that can be set is 5000ms (5 seconds). Default is 120000 (120 sec).
			4	Reserved	Reserved for future use.
-	0xA0	3	0	-	
3.3.17 Query Ethernet Connection Timeout – 0x21					
0x21	-	3	0	-	
-	0xA1	11	4	Timeout	If there is no Ethernet traffic between the host and the MGE, this timeout dictates the amount of time the MGE waits before closing its Ethernet connect and re-enabling the discovery message broadcast so a new host can connect to it. This value is sent LSB to MSB and corresponds to a time period in milliseconds. Default is 120000 (120 sec).
			4	Reserved	Reserved for future use.

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