Application Note

AN_332

VI800A Ethernet - PoE

Sample Application

Version 1.0

Issue Date: 2014-10-23

This document introduces a sample application to demonstrate the VI800A-ETH and VI800A–PoE modules. These accessory modules connect to the VM800P series of boards and provide either Ethernet connectivity (VI800A-ETH) or Ethernet connectivity with Power over Ethernet capability (VI800A-PoE).

Use of FTDI devices in life support and/or safety applications is entirely at the user's risk, and the user agrees to defend, indemnify and hold FTDI harmless from any and all damages, claims, suits or expense resulting from such use.

Future Technology Devices International Limited (FTDI)
Unit 1, 2 Seaward Place, Glasgow G41 1HH, United Kingdom
Tel.: +44 (0) 141 429 2777   Fax: + 44 (0) 141 429 2758
Web Site: http://ftdichip.com

Table of Contents

1 Introduction

This application demonstrates a simple application for the VI800A-ETH and VI800A-POE modules. The application gives a basic understanding of the plug-in board's features. The sample application is compatible with VM800P platforms.

Users can refer to the source code of the sample application, and then run the code to observe the demonstration. Editing the code is also encouraged to help learn the features of the plug-in module.

This document shows how to set up and use the sample application with the FTDI VM800P development kits in relation to an Arduino IDE.

For further details on the plug-in modules, please refer to the datasheets below:

VI800A_ETH	DS_VI800A-ETH.pdf
VI800A_POE	DS_VI800A-POE.pdf

To learn more about the Arduino IDE, please visit http://www.arduino.cc

Note: This application note uses sample application code and library API definitions/usage based on the Arduino IDE 1.0.5.

1.1 Audience

This document assumes that the reader is familiar with the VI800A-ETH or VI800A-PoE module features and operation as described in the module datasheets. In addition, familiarity of the Arduino IDE and C/C++programming language is required to understand the sample application source code. Familiarity with SPI protocol (for the communication between VM800P and the module) and with Ethernet and/or PoE are also assumed.

1.2 Scope

The Sample Application mentioned in this document is part of the Arduino IDE (1.0.5) and runs on a VM800P platform with the Ethernet/PoE board attached. The source code and supporting files are available through the Examples menu of the Arduino IDE.

2 Overview

2.1 Hardware

The diagram below shows the basic hardware setup. The VI800A plug-in module (in this case the VI800A-ETH or -PoE) is connected to the FT800 plus board. The VM800P is then connected to the PC using a micro USB cable as shown in the figure below.

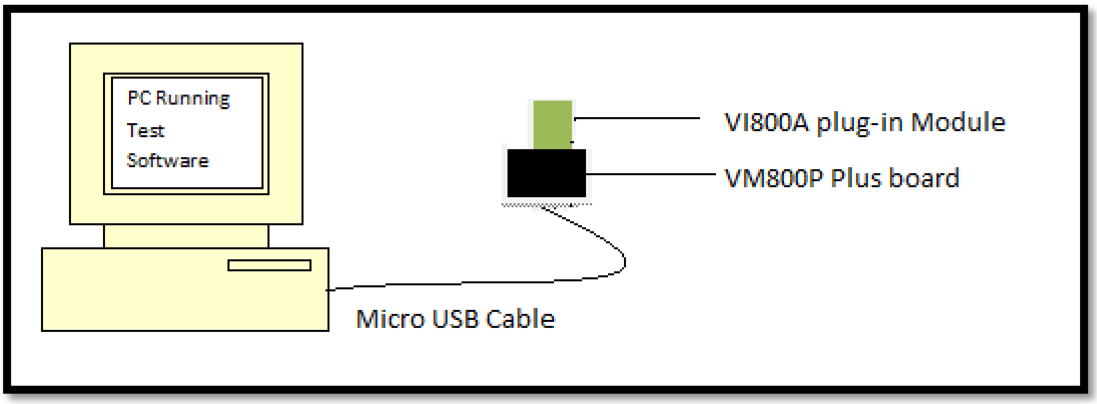


Figure 2-1 Block Diagram of Setup

2.2 Architecture

This application note demonstrates the web client application as an example for the VI800A-ETH and VI800A-PoE plug-in modules. The web client application is part of the Arduino package release and is actively maintained by the Arduino committee.

The block diagram below, demonstrates a brief architecture of the web client application with an application layer as well as the Ethernet library.

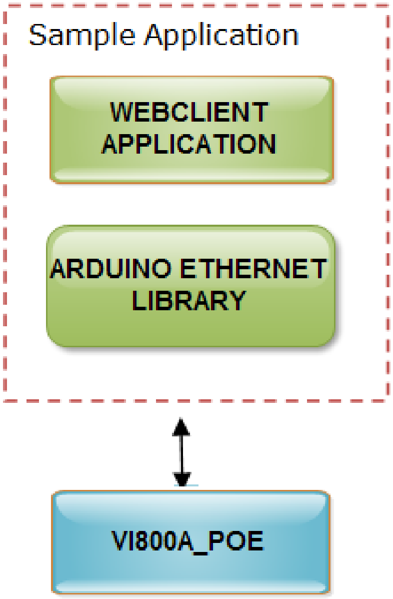


Figure 1-2 Architecture diagram

2.3 Hardware requirement

- VI800A-ETH board x 1 or VI800A-PoE board x 1
- FTDI FT800 Plus Board (VM800P) x 1
- Micro USB cable to connect VM800P to PC x 1
- TP-LINK PoE injector x 1 (for VI800A-PoE only)
- Ethernet cables

2.4 Software requirement

- Arduino IDE 1.0.5 and later
- The web client Application and Ethernet library release package (part of the standard Arduino IDE installation package)

3 Software Package Introduction

This section describes the folder structure of the web client application that is part of the standard Arduino release package.

3.1 Folder introduction

The web client application can be found at "\arduino-1.x.x\libraries\Ethernet\examples\WebClient", which contains the source code and project file "WebClient.ino".

3.2 Dependency

The Web client Application uses the SPI library and Ethernet library provided by Arduino and is supplied with Arduino IDE. Please check the Arduino website for details.

4 Setup Steps

4.1 Preparing Hardware

1. Before making any connections, refer to the following screenshot of the FT800 Plus board (VM800P). There are two Daughter Card connectors (coloured red in the image below). The VI800A-ETH or the VI800A-PoE Plug-In module must be connected to the right-hand side connector (J6).

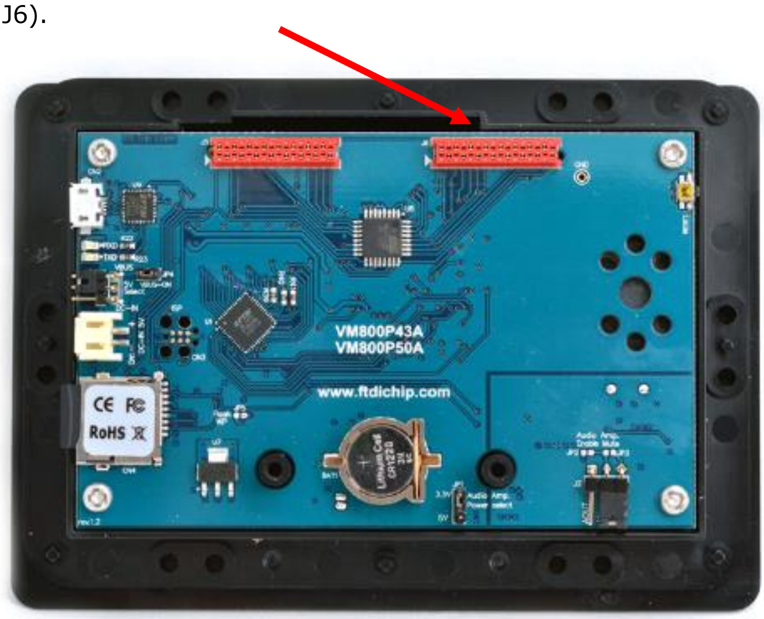


Figure 2-1 VM800P Board

2. The image below shows the VI800A-PoE module. When Jumper JP1 is connected, power will be taken from the Ethernet link (PoE). When jumper JP1 is not connected, power will be taken from the FT800 plus board. Please ensure that jumper JP1 is connected as shown below.

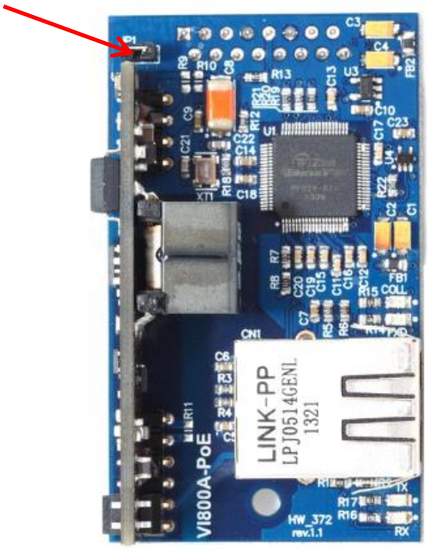


Figure 2-2 VI800A-PoE Plug-In Module

3. Now connect the VI800A-PoE to the VM800P plus board as shown below.

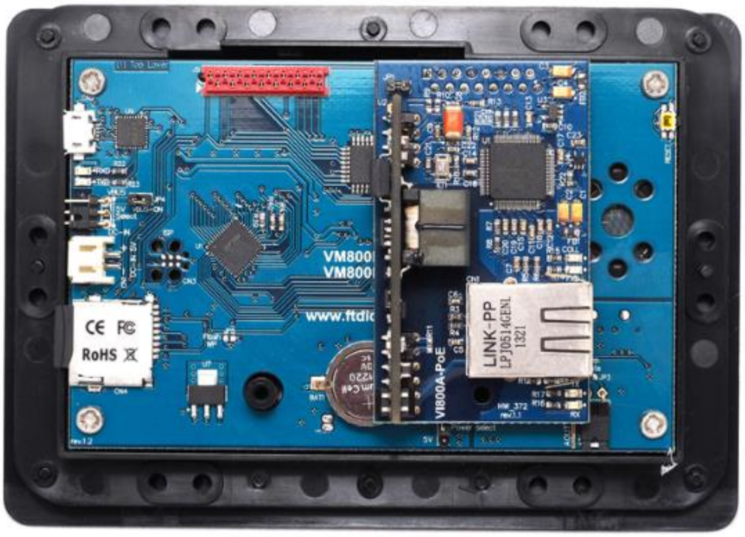


Figure 2-3 POE connected to VM800P

4. To test the PoE feature (VI800A-PoE only), a PoE injector or a switch which has PoE ports is required. In the example below, a TP-LINK PoE Injector is used to provide the PoE power.

   Note: The following instructions assume the use of a PoE injector, if using a switch port which provides PoE functionality, please connect the Ethernet cable from the switch port to the Ethernet port on the VI800A-PoE module and proceed to step 9.

   Note: If using the VI800A-ETH module (which does not support PoE) no PoE injector or PoE switch port is required. Please connect the Ethernet cable from the standard Ethernet port on the switch or router to the Ethernet port on the VI800A-ETH and proceed to step 9.

Figure 2-4 PoE Injector

5. One side of the PoE injector has a LAN IN connection and a Power In connection (which comes from the PSU provided with the injector).

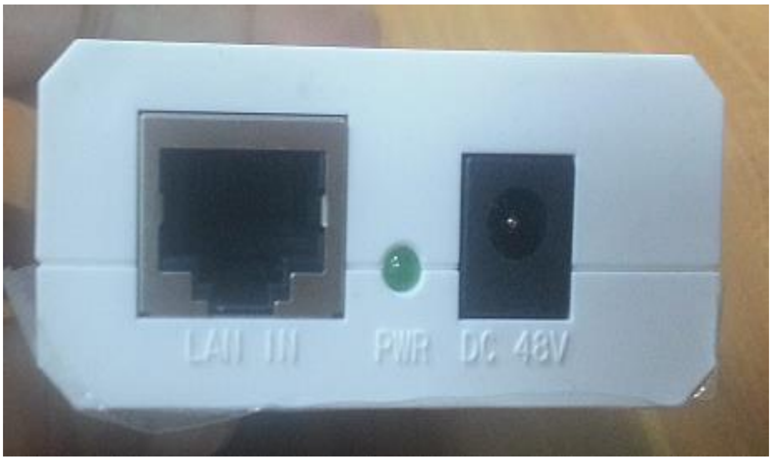


Figure 2-5 LAN IN port and PWR connector

The other side of the injector has the connection for the combined data and power.

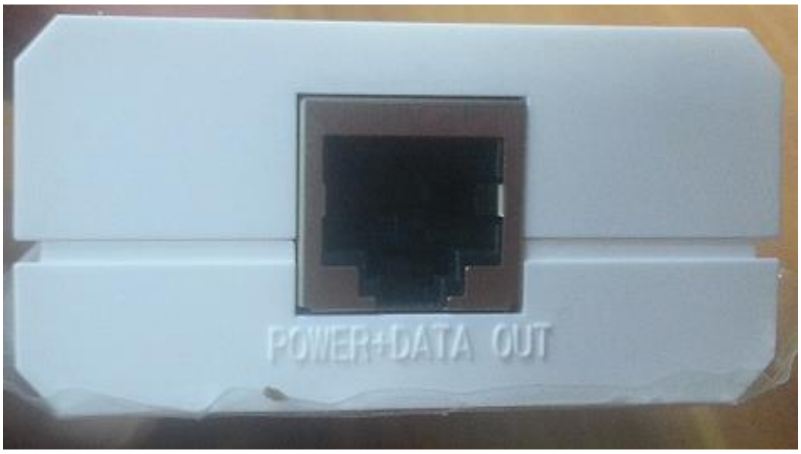


Figure 2-6 POWER+DATA OUT socket

6. First of all, the power supply is connected to the PoE injector as shown below, and the green power LED illuminates.

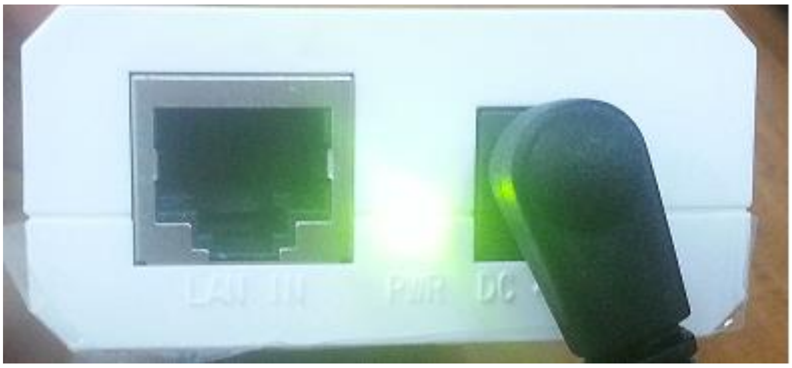


Figure 2-7 Power given to power injector

7. Then, using a standard Ethernet cable, connect the PoE injector to the VI800A-PoE. Connect one end to the 'POWER + DATA OUT' of the POE injector, and the other end to the VI800A-POE module’s Ethernet port.

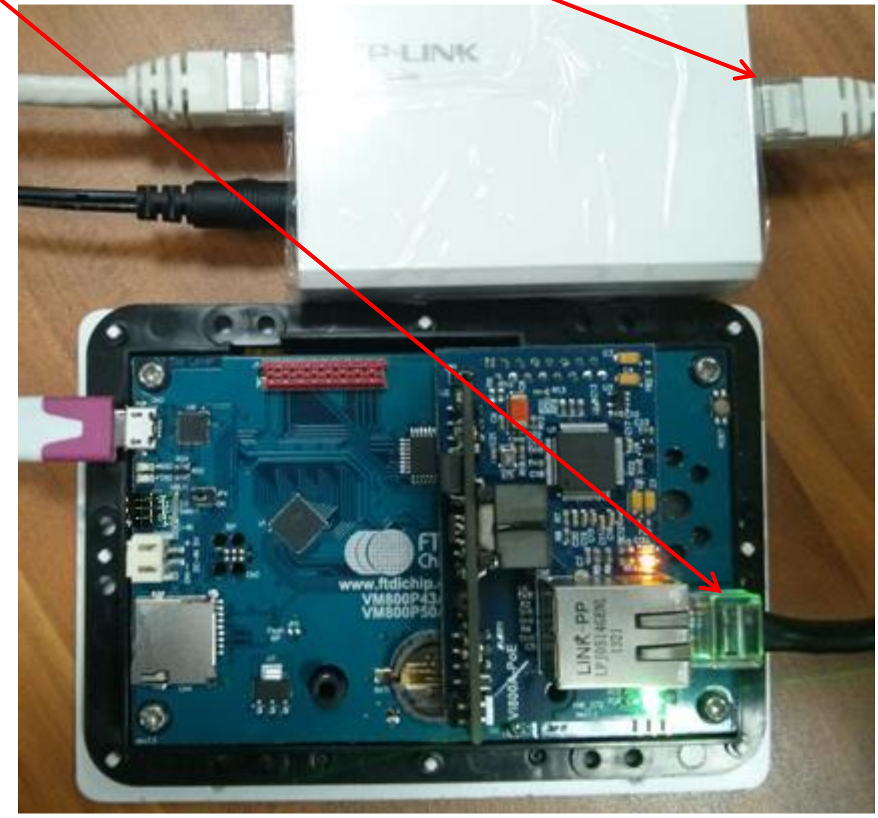


Figure 2-8 POWER+DATA OUT connection

8. Connect the Ethernet cable from the network to the PoE injector.

   Connect one end of an Ethernet cable to the 'LAN IN' of the PoE injector and the other end to a port on the Network/Router.

9. After making these connections, Tx, Rx LEDs should be on, as shown below, as the PoE is getting power over Ethernet. The FXD LED should also be on.

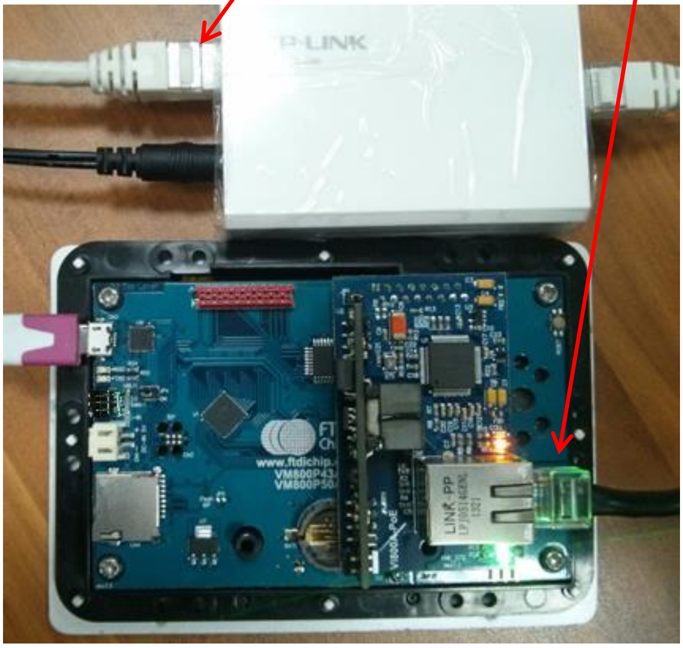


Figure 2-9 LAN IN connection

The FDX LED is shown in the following screenshot.

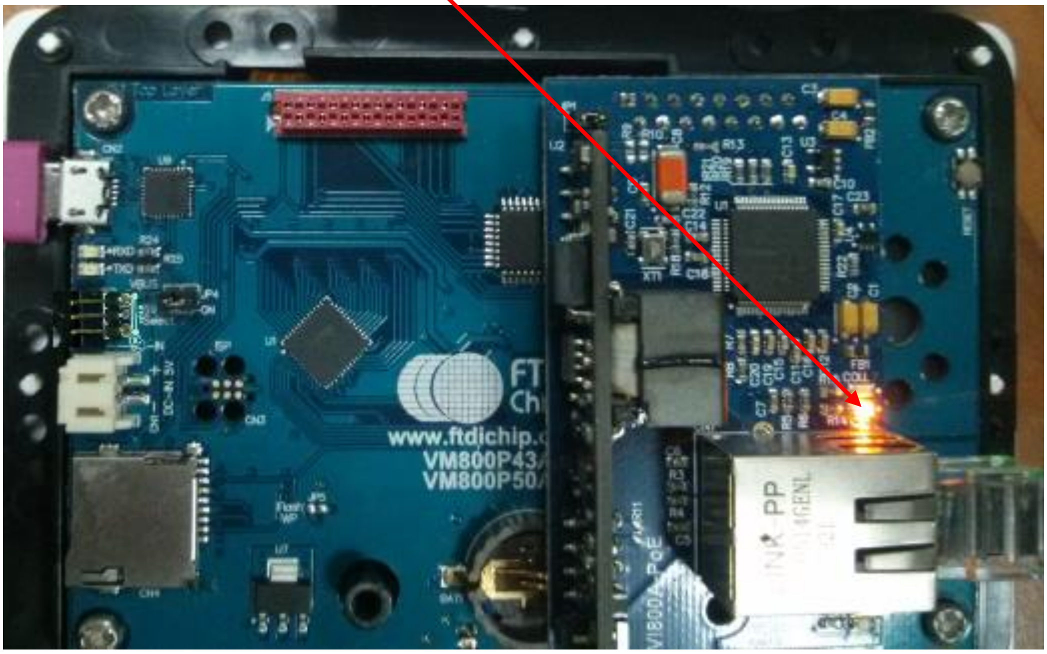


Figure 2-10 FXD LED ON

10. To upload the sample application, connect the VM800P to a PC using a micro USB cable. In order to power the board from USB for programming, the VM800P power select jumper can be connected to the VBUS position. Note that the PoE board power jumper <u>must</u> be disconnected at this point (see Note below).

    When the board is to be powered entirely from the PoE connection, the power jumper on the VI800A-PoE can be fitted but the power select jumper on the VM800P must be disconnected (see Note below)

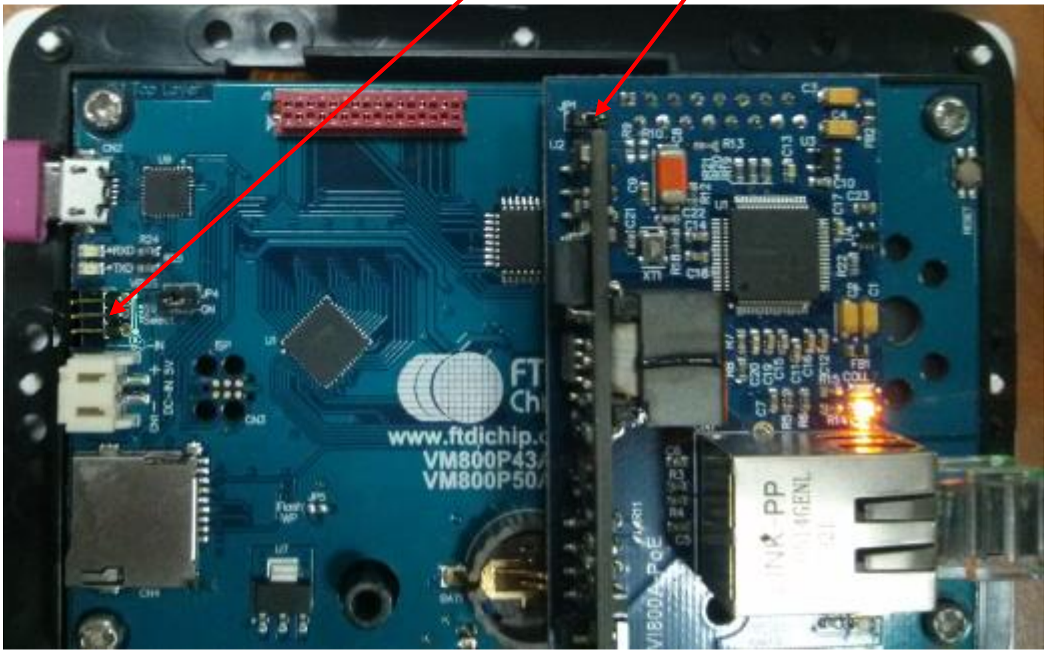


Figure 2-11 Complete Hardware setup for PoE

Note: It is important to ensure that the jumpers are configured for only one source of power. The board should not be powered from both USB and PoE simultaneously. When a USB cable is connected to the VM800P and a PoE connection is made to the VI800A-PoE simultaneously, only one of the jumpers highlighted by the arrows above must be enabled such that only one of these two power sources is connected. Otherwise, damage may result.

5 WebClient Application

5.1 Overview

This simple application is used to demonstrate an application with Arduino's Ethernet library.

A brief description of the Ethernet library APIs which are used in the WebClient application is given in the following sections.

5.1.1 Ethernet class

5.1.1.1 Ethernet.begin()

Description

Initializes the ethernet library and network settings.

With version 1.0, the library supports DHCP. When using Ethernet.begin(mac) with the proper network setup, the Ethernet shield will automatically obtain an IP address. This increases the sketch size significantly.

Syntax

```
Ethernet.begin(mac);
Ethernet.begin(mac, ip);
Ethernet.begin(mac, ip, dns);
Ethernet.begin(mac, ip, dns, gateway);
Ethernet.begin(mac, ip, dns, gateway, subnet);
```

Parameters

mac: the MAC (Media access control) address for the device (array of 6 bytes). This is the Ethernet hardware address of your shield.

ip: the IP address of the device (array of 4 bytes)

dns: the IP address of the DNS server (array of 4 bytes). optional: defaults to the device IP address with the last octet set to 1

gateway: the IP address of the network gateway (array of 4 bytes). optional: defaults to the device IP address with the last octet set to 1

subnet: the subnet mask of the network (array of 4 bytes). optional: defaults to 255.255.255.0

Returns

The DHCP version of this function, Ethernet.begin(mac), returns an int: 1 on a successful DHCP connection, 0 on failure. The other versions don't return anything.

5.1.2 IPAddress class

The IPAddress class works with local and remote IP addressing.

5.1.2.1 IPAddress()

Description

Defines an IP address. It can be used to declare both local and remote addresses.

Syntax

IPAddress(address);

Parameters

address: a comma delimited list representing the address (4 bytes, ex. 192, 168, 1, 1)

Returns

None

5.1.3 Client class

The client class creates clients that can connect to servers and send and receive data.

5.1.3.1 EthernetClient()

Description

Creates a client which can connect to a specified internet IP address and port (defined in the client.connect() function).

Syntax

EthernetClient()

Parameters

None

5.1.3.2 connected()

Description

Whether or not the client is connected. Note that a client is considered connected if the connection has been closed but there is still unread data.

Syntax

client.connected()

Parameters

none

Returns

Returns true if the client is connected, false if not.

5.1.3.3 connect()

Description

Connects to a specified IP address and port. The return value indicates success or failure. Also supports DNS lookups when using a domain name.

Syntax

client.connect()
client.connect(ip, port)
client.connect(URL, port)

Parameters

ip: the IP address that the client will connect to (array of 4 bytes)

URL: the domain name the client will connect to (string, ex.:"arduino.cc")

port: the port that the client will connect to (int)

Returns

Returns true if the connection succeeds, false if not.

5.1.3.4 available()

Description

Returns the number of bytes available for reading (that is, the amount of data that has been written to the client by the server it is connected to).

available() inherits from the Stream utility class.

Syntax

client.available()

Parameters

none

Returns

The number of bytes available.

5.1.3.5 read()

Read the next byte received from the server the client is connected to (after the last call to read()).

read() inherits from the Stream utility class.

Syntax

client.read()

Parameters

none

Returns

The next byte (or character), or -1 if none is available.

5.1.3.6 stop()

Description

Disconnect from the server.

Syntax

client.stop()

Parameters

none

Returns

none

5.2 Flowchart

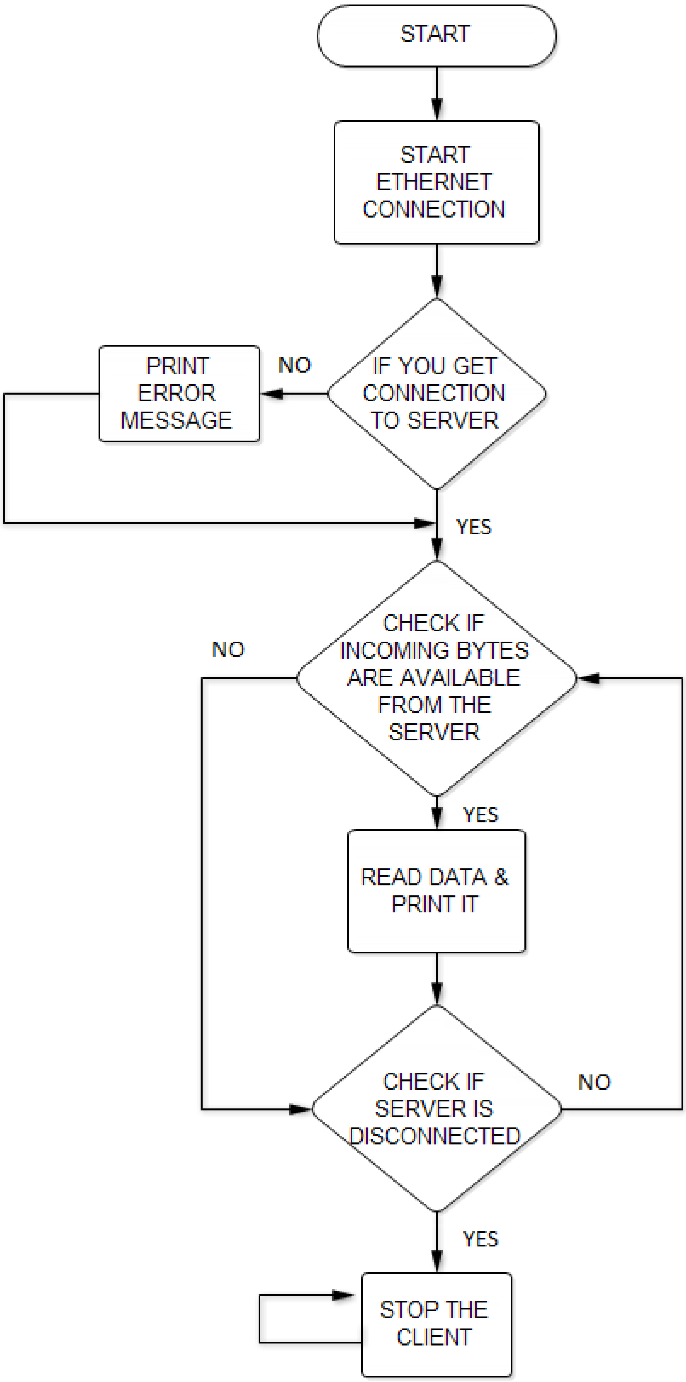
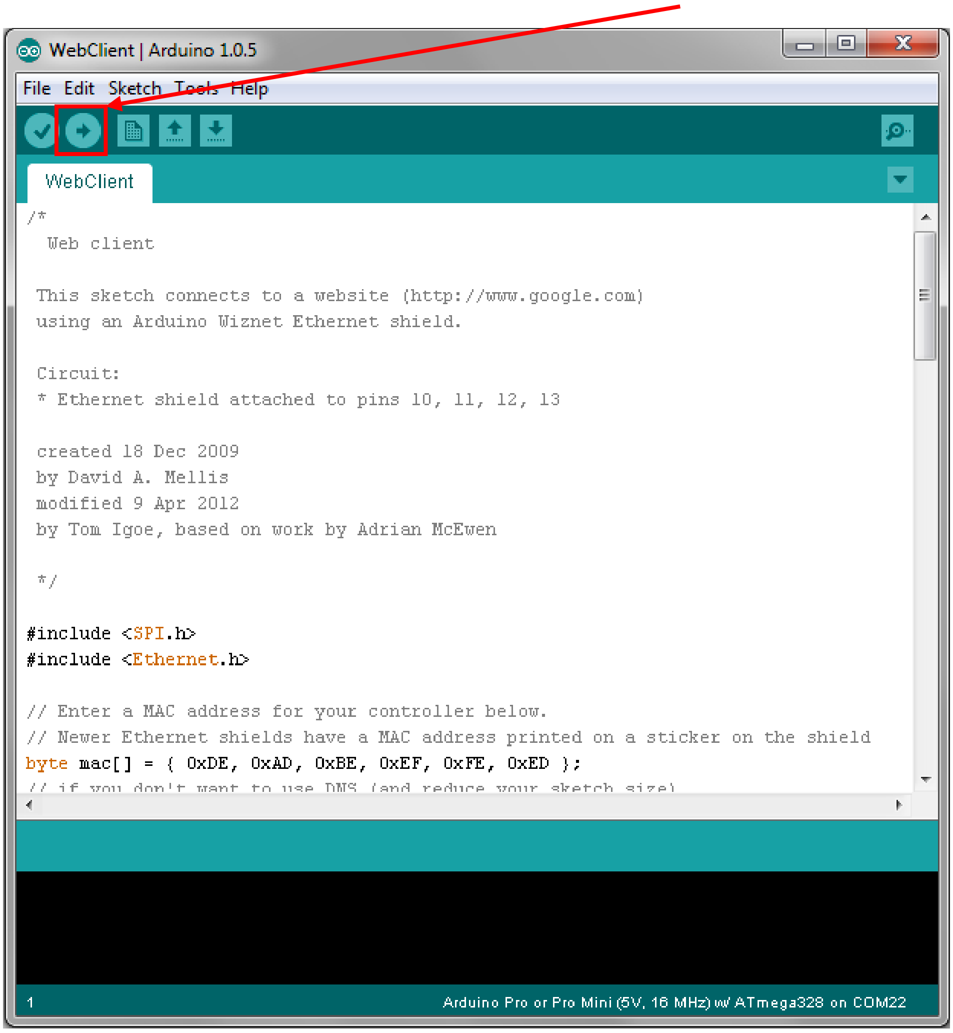

START
START ETHERNET CONNECTION
IF YOU GET CONNECTION TO SERVER
NO
PRINT ERROR MESSAGE
YES
CHECK IF INCOMING BYTES ARE AVAILABLE FROM THE SERVER
NO
YES
READ DATA & PRINT IT
CHECK IF SERVER IS DISCONNECTED
NO
YES
STOP THE CLIENT

Figure 3-1 Flowchart

6 Application execution

1. After making connections for the VI800A-PoE or –ETH module as described previously, now upload the program.

2. Open the file "\arduino-1.x.x\libraries\Ethernet\examples\WebClient \ WebClient.ino " with the Arduino IDE and the following screen will be shown. Click on the upload button or press "Ctr+R" to rebuild and "Ctrl+U" to upload the binary generated into the VM800P board.

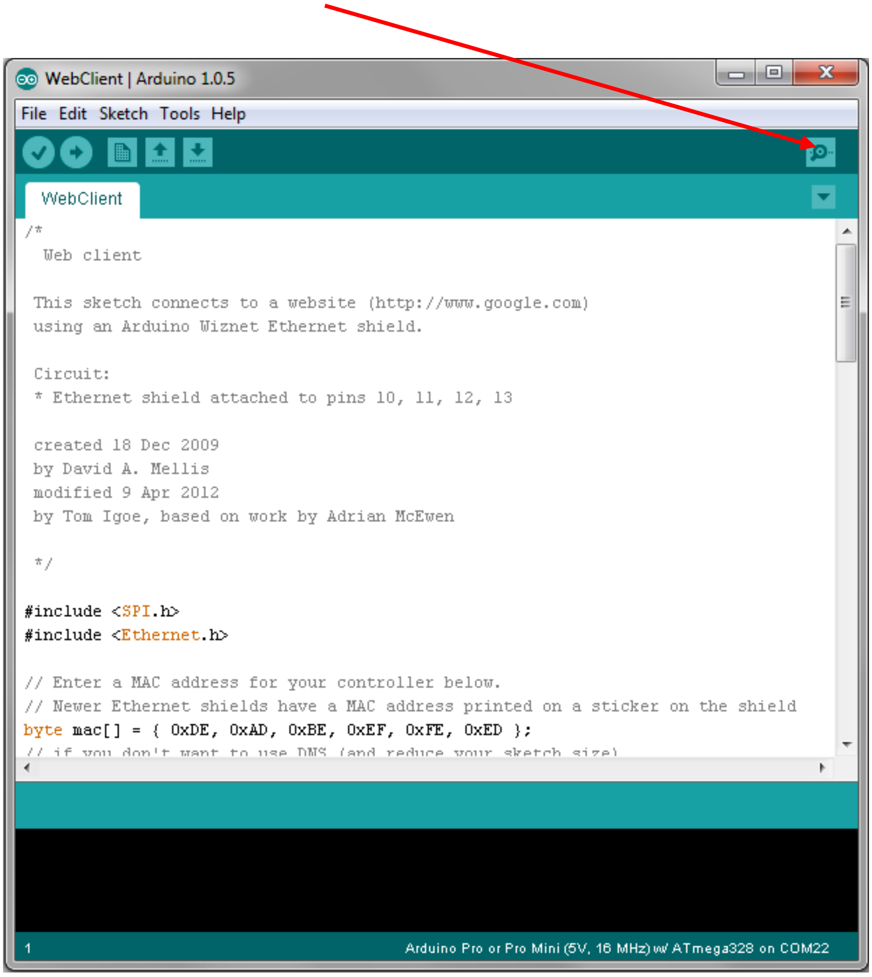


```
/*
  Web client

 This sketch connects to a website (http://www.google.com)
 using an Arduino Wiznet Ethernet shield.

 Circuit:
 * Ethernet shield attached to pins 10, 11, 12, 13

 created 18 Dec 2009
 by David A. Mellis
 modified 9 Apr 2012
 by Tom Igoe, based on work by Adrian McEwen

 */

#include <SPI.h>
#include <Ethernet.h>

// Enter a MAC address for your controller below.
// Newer Ethernet shields have a MAC address printed on a sticker on the shield
byte mac[] = { 0xDE, 0xAD, 0xBE, 0xEF, 0xFE, 0xED };
// if you don't want to use DNS (and reduce your sketch size)
```

1 Arduino Pro or Pro Mini (5V, 16 MHz) w/ ATmega328 on COM22

Figure 4-1 Upload program

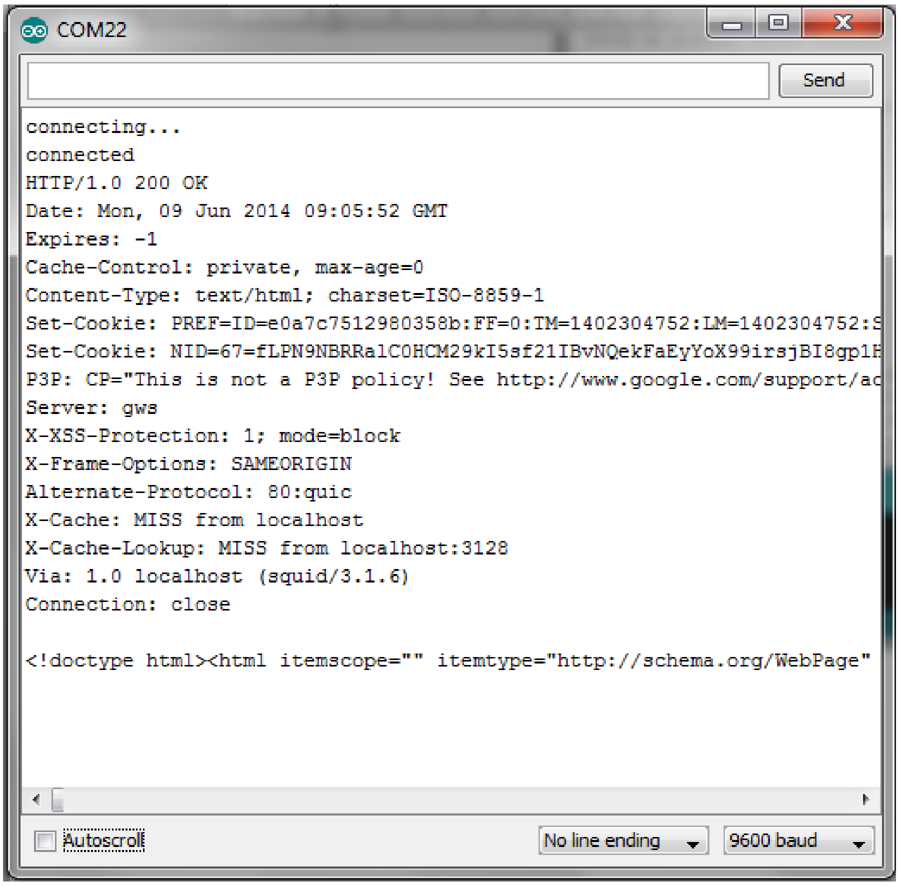
3. Open serial monitor by clicking this button,


WebClient | Arduino 1.0.5
File Edit Sketch Tools Help
WebClient
1
Arduino Pro or Pro Mini (5V, 16 MHz) w/ ATmega328 on COM22

```
/*
  Web client

 This sketch connects to a website (http://www.google.com)
 using an Arduino Wiznet Ethernet shield.

 Circuit:
 * Ethernet shield attached to pins 10, 11, 12, 13

 created 18 Dec 2009
 by David A. Mellis
 modified 9 Apr 2012
 by Tom Igoe, based on work by Adrian McEwen

 */

#include <SPI.h>
#include <Ethernet.h>

// Enter a MAC address for your controller below.
// Newer Ethernet shields have a MAC address printed on a sticker on the shield
byte mac[] = { 0xDE, 0xAD, 0xBE, 0xEF, 0xFE, 0xED };
// if you don't want to use DNS (and reduce your sketch size)
```

Figure 4-2 Open serial monitor

4. After opening the serial monitor, the following window will open, showing a connection has been made.



```
connecting...
connected
HTTP/1.0 200 OK
Date: Mon, 09 Jun 2014 09:05:52 GMT
Expires: -1
Cache-Control: private, max-age=0
Content-Type: text/html; charset=ISO-8859-1
Set-Cookie: PREF=ID=e0a7c7512980358b:FF=0:TM=1402304752:LM=1402304752:S
Set-Cookie: NID=67=fLPN9NBRRalC0HCM29kI5sf21IBvNQekFaEyYoX99irsjBI8gp1H
P3P: CP="This is not a P3P policy! See http://www.google.com/support/ac
Server: gws
X-XSS-Protection: 1; mode=block
X-Frame-Options: SAMEORIGIN
Alternate-Protocol: 80:quic
X-Cache: MISS from localhost
X-Cache-Lookup: MISS from localhost:3128
Via: 1.0 localhost (squid/3.1.6)
Connection: close

<!doctype html><html itemscope="" itemtype="http://schema.org/WebPage"
```

Figure 4-3 Serial monitor window showing Connection details

5. The sample code in combination with the API functions described previously can now be used to create applications where the VM800P has network access.

7 Contact Information

Head Office – Glasgow, UK

Future Technology Devices International Limited
Unit 1, 2 Seaward Place, Centurion Business Park
Glasgow G41 1HH
United Kingdom
Tel: +44 (0) 141 429 2777
Fax: +44 (0) 141 429 2758

E-mail (Sales)	sales1@ftdichip.com
E-mail (Support)	support1@ftdichip.com
E-mail (General Enquiries)	admin1@ftdichip.com

Branch Office – Tigard, Oregon, USA

Future Technology Devices International Limited
(USA)
7130 SW Fir Loop
Tigard, OR 97223-8160
USA
Tel: +1 (503) 547 0988
Fax: +1 (503) 547 0987

E-Mail (Sales)	us.sales@ftdichip.com
E-Mail (Support)	us.support@ftdichip.com
E-Mail (General Enquiries)	us.admin@ftdichip.com

Branch Office – Taipei, Taiwan

Future Technology Devices International Limited
(Taiwan)
2F, No. 516, Sec. 1, NeiHu Road
Taipei 114
Taiwan , R.O.C.
Tel: +886 (0) 2 8791 3570
Fax: +886 (0) 2 8791 3576

E-mail (Sales)	tw.sales1@ftdichip.com
E-mail (Support)	tw.support1@ftdichip.com
E-mail (General Enquiries)	tw.admin1@ftdichip.com

Branch Office – Shanghai, China

Future Technology Devices International Limited
(China)
Room 1103, No. 666 West Huaihai Road,
Shanghai, 200052
China
Tel: +86 21 62351596
Fax: +86 21 62351595

E-mail (Sales)	cn.sales@ftdichip.com
E-mail (Support)	cn.support@ftdichip.com
E-mail (General Enquiries)	cn.admin@ftdichip.com

Web Site

http://ftdichip.com

Distributor and Sales Representatives

Please visit the Sales Network page of the FTDI Web site for the contact details of our distributor(s) and sales representative(s) in your country.

System and equipment manufacturers and designers are responsible to ensure that their systems, and any Future Technology Devices International Ltd (FTDI) devices incorporated in their systems, meet all applicable safety, regulatory and system-level performance requirements. All application-related information in this document (including application descriptions, suggested FTDI devices and other materials) is provided for reference only. While FTDI has taken care to assure it is accurate, this information is subject to customer confirmation, and FTDI disclaims all liability for system designs and for any applications assistance provided by FTDI. Use of FTDI devices in life support and/or safety applications is entirely at the user's risk, and the user agrees to defend, indemnify and hold harmless FTDI from any and all damages, claims, suits or expense resulting from such use. This document is subject to change without notice. No freedom to use patents or other intellectual property rights is implied by the publication of this document. Neither the whole nor any part of the information contained in, or the product described in this document, may be adapted or reproduced in any material or electronic form without the prior written consent of the copyright holder. Future Technology Devices International Ltd, Unit 1, 2 Seaward Place, Centurion Business Park, Glasgow G41 1HH, United Kingdom. Scotland Registered Company Number: SC136640

Appendix A– References

Document References

1. FT800 Datasheet
2. FT800 Programmers Guide
3. EVE Product Page

Acronyms and Abbreviations

Terms	Description
Arduino Pro	The open source platform variety based on ATMEL's ATMEGA chipset
EVE	Embedded Video Engine
SPI	Serial Peripheral Interface
UI	User Interface
USB	Universal Serial Bus

Appendix B – List of Figures

List of Figures

Appendix C – Revision History

Document Title:	AN_332 VI800A Ethernet - PoE Sample Application
Document Reference No.:	FT_001071
Clearance No.:	FTDI#419
Product Page:	http://www.ftdichip.com/EVE.htm
Document Feedback:	Send Feedback

Revision	Changes	Date
1.0	Initial release	2014-10-23