VR-100A: User Manual

Support Info

Manovega Pte Ltd, #03-20, 71 Ayer Rajah Crescent, Singapore, 139951

Telephone: +65 96417415 (Singapore) +1 (408) 335-7611 (USA)

Email: enquiries@manovega.com

Contents

1 Introduction

Welcome

Thank you for choosing the Manovega VR-100A Wireless Video Router. Thanks to the patented "Vega Engine", the VR-100A will allow you to stream live video over multiple bonded wireless broadband connections, with glass to glass latencies as low as 1.5 seconds.

How it works

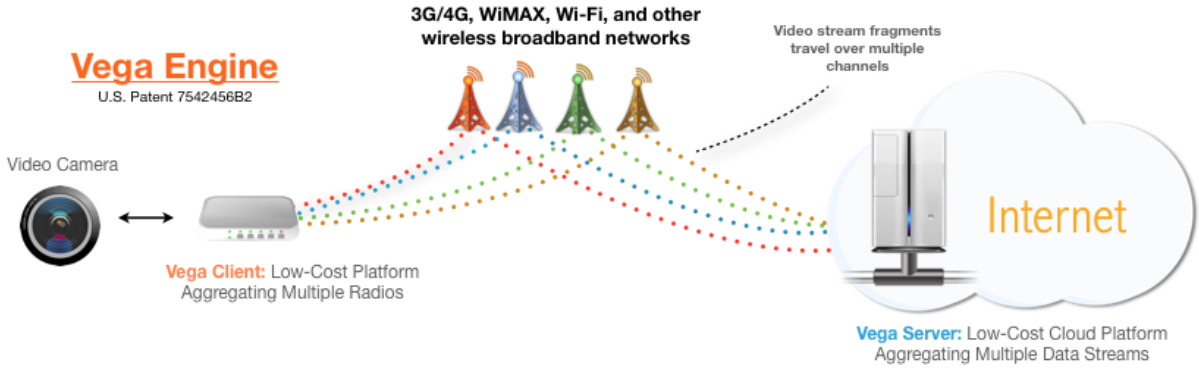

Figure 1: Architecture of Vega Engine system

In recent years, the availability of wireless broadband through networks such as 3G has rapidly increased. These offer end users mobile access to the internet at reasonable download speeds, but are unable to handle upload heavy applications such as live video streaming, which typically require access to a fixed line or short-range Wi-Fi network. Through our patented "Vega Engine", Manovega have developed a solution that finally brings mobility to live video over IP.

The "Vega Engine" is composed of two complimentary pieces of software – the Vega Client (embedded on the VR-100A unit) and the Vega Server (installed on a server). The Vega Client receives data, such as live video, and splits it across the available wireless broadband connections, such as 3G/4G, Wi-Fi and WiMax. The split data is recombined at the Vega Server. In other words, the available bandwidth is aggregated, allowing for higher upload speeds. The result is live video streaming in areas where it would otherwise be impossible to do so.

Network Topologies

The "Vega Engine" software allows for a range of network configurations depending upon the users requirements.

Server modes

Direct Mode When data is being sent over any network, each leg of the journey adds a delay to the journey time. Achieving low latencies is therefore a matter of reducing the number of legs of the journey. Ideally, therefore, we would like to send data from the VR-100A directly to a PC. This is possible over a local network, but that would limit the mobility of the user. Retaining mobility therefore necessitates that the data is sent over the internet, using wireless broadband networks such as 3G/4G, WiMax etc. This adds a bit of time, but we can still send data directly to a PC and achieve great results. So long as public IP address is available, the VR-100A can stream directly to any server or PC.

Relay Mode If the PC or server you wish to stream to does not have a public IP address, the "Vega Engine" network can configured so that another server (which does have a public IP) is used to relay the data to the end server. Although this adds a second hop to the journey, and therefore additional latency, it does allow streaming to any computer connected to the internet.

Client Modes

RTSP Push In RTSP push mode, the VR-100A will try to send to the server any data it receives from the encoder. This adds approximately 2 seconds to the total latency stream because the software of the VR-100A is actively passing the data on.

RTSP Pull mode In RTSP pull mode, the VR-100A acts instead as a router for the server, which asks for data directly from the cube. In pull mode, the unit will send some dummy data to the server to check on the connection to the server.

What's in this Guide?

- Chapter 1: Introduction
  - This chapter describes the "Vega Engine" and the contents of this user guide
- Chapter 2: Quickstart: Start Streaming Now!
  - This chapter describes what items are included in the VR-100A package and how to start streaming out of the box.
- Chapter 3: The VR-100A unit
  - This chapter describes the features of VR-100A unit.
- Chapter 4: Vega Client GUI
  - This chapter describes use of the Vega Client GUI.
- Chapter 5: Vega Server
  - This chapter describes operation of the Vega Server software.
- Appendix 1: Troubleshooting
  - This appendix describes common issues and solutions.

2 Quickstart: Start Streaming Now!

What's in the Box?

The VR-100A comes packaged with the following items:

- The VR-100A unit
- Broadband E180 HSPA USB Rotate Stick Modems (8 no.s)
- Internal battery
- Ethernet cable
- Battery charger
- Direct DC Adaptor for use with external 220V AC power source
- Customised Carrying Case Using the GUI: Status

Optional purchases:

- Teradek CubeTM H.264 Encoder

Live Video Streaming Using The Teradek Cube Encoder using RTSP push

This quickstart assumes that the "Vega Engine" software has been installed on your server already, and that you are using the Teradek Cube Encoder. For more detail software see Section 6.

1. Connect the Teradek Cube Encoder to camera using a BRC cable. Connect the Cube to its battery.
2. Connect Teradek Cube Encoder to the VR-100A using the ethernet cable. Connect VR-100A to its battery.
3. Insert modems into VR-100A USB slots.
4. Push the power switch on the VR-100A to turn the unit on.
5. Use a smartphone, iPad or laptop to connect to the VR-100A Wi-Fi access point. The default is SSID is VEGA-AP.
6. Open the Vega Client GUI by connecting to 172.16.1.1 in a web browser.
7. Open the configuration page. Make sure that the Encoder type is set to "Wired Cube", and the Server Settings correspond to the location of your server. Click the update button.
8. Congratulations! You are now streaming live video to your server! The stream can be viewed using media players such as VLC at the address, udp://@:10000.

3 The VR-100A Unit

The Back Panel

Figure 2: The back panel of the VR-100A

DC 12V	This is the input for the power supply.
LED	When the LED is on, data is succesfully being sent to the Vega Server
COM1	Used to connect a monitor for troubleshooting purposes.
USB	These USB ports can be used for 3G/WiMax modems, Wi-Fi adaptors etc.
DVI	Used to connect a monitor for troubleshooting purposes.
LAN	This an ethernet port that can be used to connect to network devices, or to a PC.
PWR SW	Push this button to turn the unit on. When switched on, holding this button down for approximately 5 seconds turns off the unit.
ANT	This is the antenna port for the on board Wi-Fi chipset.

The Front Panel

Figure 3: The front panel of the VR-100A

USB	These USB ports can be used for 3G/WiMax modems, Wi-Fi adaptors etc.

4 Vega Client GUI

The VR-100A has a powerful browser based GUI installed that controls the Vega Client. This section describes how to access the GUI and how to use it.

Accessing the GUI

Because the GUI is browser based, the VR-100A can be controlled using devices such as smartphones, iPads etc. To access the GUI, you must first connect to the VR-100A access point. This can be done via a Wi-Fi or ethernet connection. The default SSID of the VR-100A is VEGA-AP.

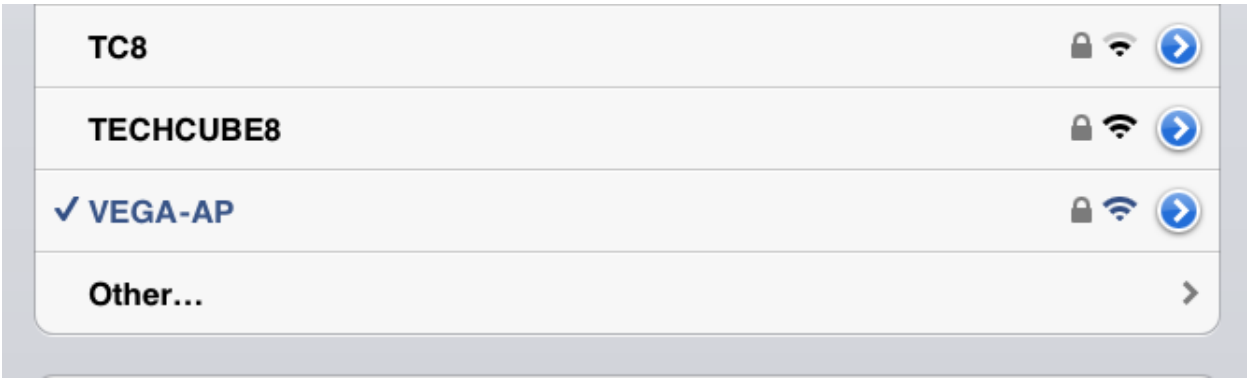

Figure 4: Connecting to the VR-100A Access Point

Once connected, open a browser window and enter the router's default IP address, 172.16.1.1, into the address field. If succesful, you will be presented with the GUI home page.

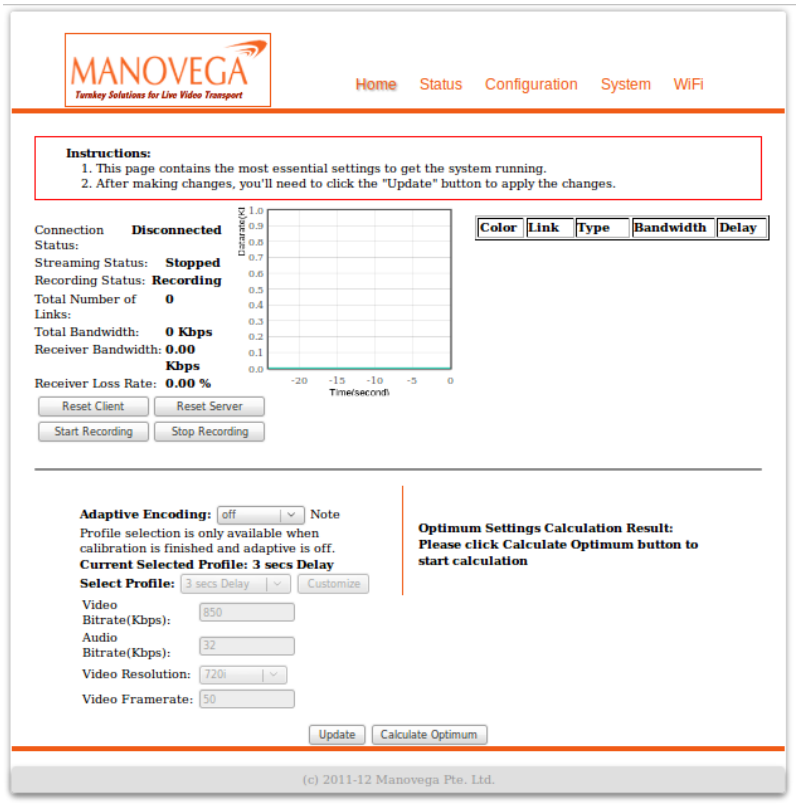

Figure 5: The GUI Client Home Page

Using the GUI: The Home Page

The GUI home page displays the most important and useful information regarding the status of the "Vega Engine" Network.

Vega Engine Status

Connection Status	Gives the current status of the connection to the Vega Server
Streaming Status	Gives the current status of data streaming to the Vega Server
Recording Status	States whether the Vega Server is saving the data stream.
Total Number Of Links	The number of wireless connections currently in use.
Total Bandwidth	The total bandwidth used by the VR-100A
Receiver Bandwidth	The total bandwidth available to the VR-100A from the network point.
Receiver Loss Rate	The average packet loss rate for the last 60 seconds. A packet loss rate above 1% will prevent smooth streaming at low latencies.
Reset Client	Restarts the Vega Client.
Reset Server	Restarts the Vega Server.
Start Recording	Commands the Vega Server to start recording incoming data to file.
Stop Recording	Commands the Vega Server to stop recording incoming data to file.
Bandwidth Graph	Displays the current bandwidth being used by each modem over time. The blue line displays the bitrate at which the encoder is sending data to the VR-100A.
Modem Table	Displays the current status of each modem, including connection type, current bandwidth use and packet round trip time.
Adaptive Encoding	The VR-100A can ask the video encoder to send data to it a constant bitrate (which can be defined on the configuration page) or it can use ask for data at a bitrate that varies according to the bandwidth available. Using adaptive encoding, the VR-100A is able to stream at the best possible quality for a given set of wireless networks.
Calculate Optimum	With the calculate optimum algorithm the VR-100A can determine the available bandwidth by attempting to send as much data as possible to the server, and then measuring the round trip times of the packets it sent. Calculate optimum then returns the excess available bandwidth at a variety of latency settings. 0kbps indicates that network conditions would not be able to support streaming at that latency.

Using the GUI: Status

The Status page provides a more in depth look at the workings of the VR-100A.

Statistics

Bandwidth Graph	Displays the current bandwidth being used by each modem over time. The blue line displays the bitrate at which the encoder is sending data to the VR-100A.
Total Number Of Modems	The number of modems connected to the VR-100A at the current time.
ISP modems	The number of 3G modems connected to the corresponding ISP.
Other Links	The number of Wi-Fi, WiMax, ethernet connections etc. connected to the VR-100A.

Modem Table

Modem Name	Displays the modem name. For 3G modems, this is in the format ISP-n where n is a number indicating the order of connection i.e. the 4th modem to be plugged into the VR-100A from M1 will be called M1-4. 4G and WiMax modems follow the same notation. Wi-Fi connections are given the name Wi-Fi-n, where n indicates the order of connection. Ethernet connections are assigned names in the format eth(n) where (n) indicates the ethernet port number.
IP	This is the IP address of the modem. If this is a public IP address, the GUI client can be accessed from any device connected to the internet by typing the IP address into a web browser.
Bandwidth	The bandwidth currently being used by the modem at the current time (in kbps).
Total Bytes	The total data sent by the modem since connection.
RTT	The round trip time of packets sent by the modem.

Using the GUI: Configuring your stream

The GUI configuration page is used to define the key parameters for succesful operation of the VR-100A.

Transmission

Delay	Sets the latency at which the VR-100A will send data.
Retransmission	Sets whether or not the VR-100A will attempt to resend lost packets.
Retransmission Count	Sets the number of retransmissions the VR-100A will attempt.

Local Settings

Local Wired IP	Sets the IP address at which the VR-100A will be found on a local network if connected by the ethernet port.
Local Wireless IP	Sets the IP address at which the VR-100A will be found on a local network if connected by Wi-Fi.
Local Wireless SSID	Sets the service set identifier of the VR-100A on a local network if connected by Wi-Fi.

Server Settings

Destination IP	This is the IP address of the server you wish to stream to.
Destination Port	This is the listening port of the server you wish to stream to.
Server Output IP	This is the IP address at which the stream will be found on the local network of the server.
Server Output Port	This is the port at which the stream will be found on the local network of the server.

Encoder General

Encoder Type	This should be set to the encoder currently connected to the VR-100A. Remote types are used for pulling data (i.e. the VR-100A will send data on request from the Vega Server) while regular types are used for pushing data (i.e. the VR-100A will constantly send data to the Vega Server). In Simple and Test modes the VR-100A will generate dummy data to stream to the Vega Server. This can be used for troubleshooting and testing.
Input Stream Type	The VR-100A can currently only use streams encoded in the RTSP protocol.
Encoder IP	This should be set to the IP address of the encoder.
Encoder HTTP Port	This should be set to the HTTP port of the encoder.
Encoder RTSP Port	This should be set to the RTSP port of the encoder.

Encoder Audio

Encoder Audio	Sets the bitrate at which the encoder attempts to encode audio.

Encoder Video

The settings available under this section are dependent upon the encoder type selected. The settings described below are for the Teradek Cube encoder.

Adaptive Encoding	Sets whether or not adaptive encoding is used.
Encoding Bitrate	Sets the bitrate at which the encoder attempts to encode video.
Resolution	Sets the resolution at which the encoder attempts to encode video.
Frame Rate	Sets the frame rate at which the encoder attempts to encode video.
GOP Size	Determines the group of pictures structure.
Profile	Sets the compression profile. High is optimal for most applications.
Cache Latency	Sets the size of the cache. Decreasing this can reduce latency, but at the expense of video stability. 300ms is optimal for most applications.
Safe Mode	Safe mode prevents the real encoding bitrate from going too high when the encoder tries to match the set bitrate. In most applications, this should be left on unless plenty of spare bandwidth is available.

Using the GUI: System and Wi-Fi

System

This page allow users to restore the VR-100A to the factory default and upgrading firmware.

Wi-Fi

1. Click the scan button to start scanning for WiFi networks.
2. Select a network to connect to.

5 Using the Vega Server

To the start streaming to your server you must first run the Vega Server software. The first step is to connect and locate the Vega Server files. All files relating to the Vega Server will be located in a folder named after the software version number, e.g. folder name 1.0.6 for software version 1.0.6.

Running in Direct mode

To use the VR-100A in direct point-to-point mode, the program "VegaServer.exe" must be running on the end device. "VegaServer.exe" takes the incoming split data and reassembles it in the correct fashion for playout. An associated file, "VegaServer.xml" sets the listening port for the incoming stream, as well as the local IP address at which the stream can be found. The stream can be played out by directing a media player such as VLC to this IP address.

Running in Relay mode

To use the VR-100A in relay mode, "VegaServer.exe" must be running on the end device, but a UDP tunnel must be set up between the relay server and the end device. The tunnel can be started by running the program "simple_udp_server.exe" on the relay server, and "simple_udp_client.exe" on the end device. As before, listening ports for "VegaServer.exe" are defined in "VegaServer.xml".

A Troubleshooting: Tips and Techniques

Diagnosing the VR-100A

While using the VR-100A problems may arise that do not have an obvious source. In these cases you can use SSH to investigate and determine the cause of the problem.

1. Connect the VR-100A to your computer using an ethernet cable.
2. Open a terminal and set your local IP address to 192.168.2.10/24. On Linux machines this can be done using the command *sudo ifconfig eth0 192.168.2.10/24*.
3. Connect using SSH by typing *ssh root@192.168.2.1*. When prompted, enter "secret" as the password.
4. You should now be connected to the root folder of the VR-100A's hard drive.

Modem Problems

There are a few problems that can cause modems to stop functioning properly. The first thing to check is that the USB ports are recognised. This can be done by entering the command *lsusb,* which will display all connected USB devices. If the number of USB devices displayed is less than the number of USB modems connected, it could be that the USB port is not functioning.

If the modem appears in the list as a USB storage device, then it is likely a driver issue. The VR-100A has a Linux based operating system and can only use USB modems that have drivers available for Linux.

Network Problems

You can also use the command line to diagnose networking issues, e.g. cannot connect to the Wi-Fi access point. The command *ifconfig* will display all the operating network devices. If the Wi-Fi device does not appear on this list, there is a hardware issue.