



Vista Camera & WiFi Development Board Hardware

1. Overview

The Vista development board allows for quick and easy entry into the remote camera and wireless networking markets. Attached to a NET+50 development board, the Vista board provides a complete platform for developing and demonstrating 802.11b wireless connectivity and a very powerful and flexible real-time video and still image camera. Application software can use just the WiFi interface, just the camera portion, or combine the two to become a wireless camera.

The Internet camera part of the design uses a video processor from ChipWrights and a camera sensor from Omnivision. Several versions of the camera sensor can be used, including resolutions of 1280x1024 and 1600x1200. The WiFi solution employs a CompactFlash socket that accepts cards based on the Intersil Prism 2.5 chipset.

2. Hardware description

2.1 Block diagram

The block diagram on the next page shows the major components of the Vista board. The board attaches to a NET+50 development board available from NetSilicon. A WiFi CompactFlash card is inserted into the connector, and a camera evaluation board from Omnivision fastens to the board Vista board and talks to the video processor.

2.2 Buffered system bus

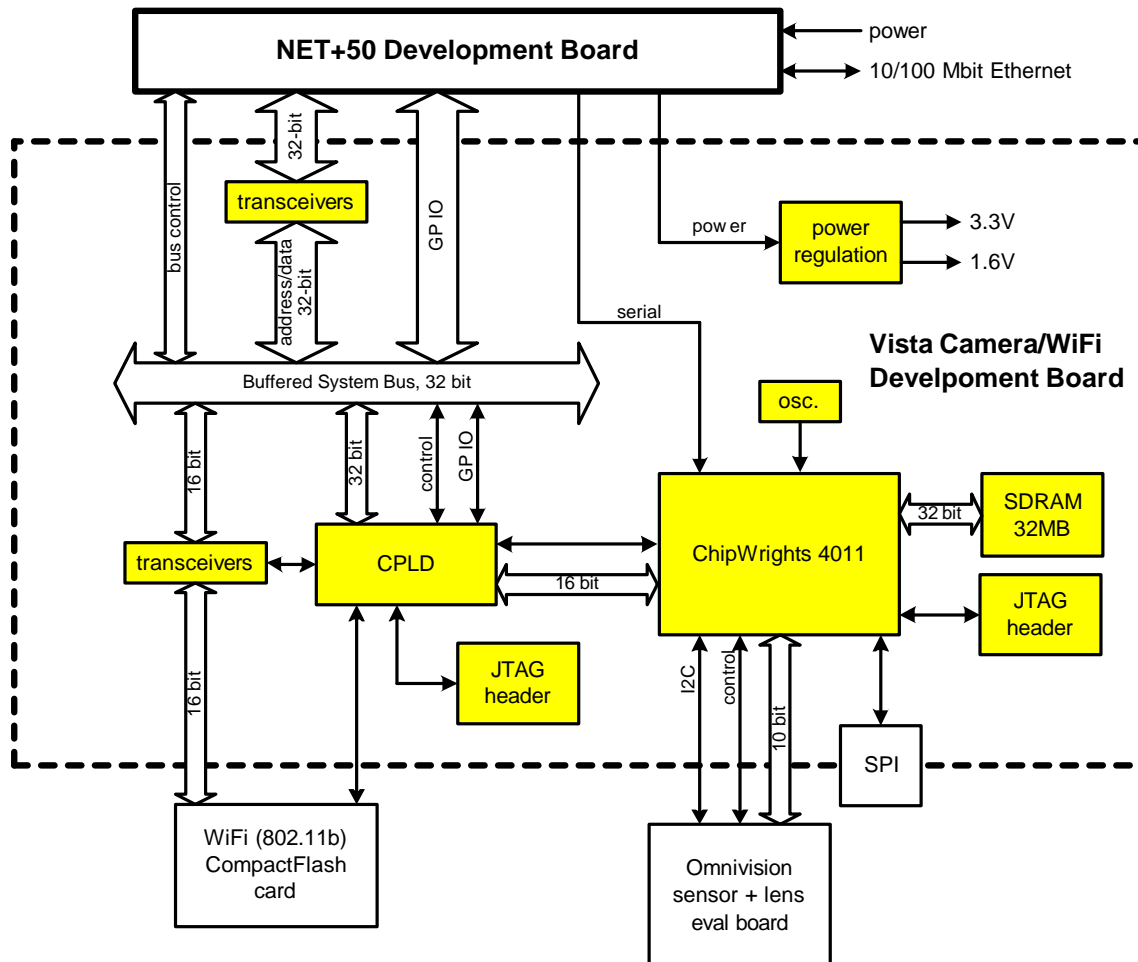
It is necessary to buffer the 32-bit data bus since the NET+50 bus drivers are not strong enough to drive all of the devices loading down the data bus on the Vista board. The board uses standard transceivers in the 32-bit data bus only.

2.3 WiFi operation

The interface with the WiFi card is 16-bits wide. The CPLD is used to generate the clocking and control signals needed for the transceivers and CompactFlash

bus. The lower 10 address bits are used by the CompactFlash as general purpose address bits, while the next two address bits are used to select register versus I/O space within the CompactFlash device. Data transfers are done by simple read/write access, not DMA.

Read and write cycles do not use wait states, but instead use CF_WAIT_N from CompactFlash device to drive TA (transfer acknowledge) back into the NET+50.



2.4 Camera operation

The streaming video data path changes from 16 bits wide at the CW4011 video processor to 32 bits wide at the NET+50. This is done to allow for more efficient data transfers into the NET+50 processor. The CPLD pulls a pair of 16-bit words out of the CW4011 whenever the CW4011 generates a read request. The CPLD then generates a DMA read request to the NET+50, and a single 32-bit transfer then takes place.

The read request from the CPLD to the NET+50 can be done either as an interrupt or as a DMA cycle. The sample application provided with the Vista board uses DMA transfers, but the board is wired so that interrupts can be used instead.

Downloading code to the CW4011 is done through CW4011's HPI port. The NET+50 uses standard read/write address/data bus cycles, and the CPLD generates the proper control signal timing to the CW4011. Each read/write cycle is slow because of the HPI port's timing, but since the CW4011's code is only done at startup, this slow operation does not affect camera performance once the CW4011's program is downloaded.

2.5 CPLD

In order to provide spare I/O pins and internal gates, a 144-pin Xilinx CPLD (part number XC95144XL-5TQ144C) is used on the Vista board. The schematic diagram included with the board shows the internal circuitry. A JTAG header is included in the Vista board to allow for changes to the CPLD.

For new designs, a 44-pin CPLD (Xilinx part number XC9536XL-10VQ44C) can be used for most WiFi applications, and a 100-pin CPLD ((Xilinx part number XC9572XL-5TQ100C) will work for some camera designs. These CPLDs are smaller and much less expensive than the one used on the Vista board.

2.6 ChipWrights CW4011

The CW4011 is a video processor is a combination RISC and 32-bit fixed-point DSP that is designed specifically for video applications. The chip and its associated libraries support Digital Camera Image Processing, MPEG-4, MPEG-2, M-JPEG, JPEG, JPEG2000, H.263, MP3, AAC and many others formats.

New designs may prefer to use the 4511 if an LCD display or USB interface are needed. More is available at www.chipwrights.com.

2.7 Camera sensor eval board

This small add-on board consists of an Omnivision camera sensor and an integrated lens. More information about these evaluation modules is available at www.ovt.com.

2.8 WiFi interface

WiFi is accommodated using a CompactFlash connector and ejector. The driver developed for NetOS 6 is designed to work with 802.11b CompactFlash boards based on the Intersil Prism 2.5 chipset. The Vista board has been successfully testing using the NetGear MA701 and Ambicom WL1100C CompactFlash cards.

3. Designing your own wireless or camera product

The main components to a wired network camera are:

- NetARM core (processor, Flash, SDRAM)
- PHY and RJ45 w/magnetics
- CPLD
- CW4011 video processor
- Omnivision sensor plus lens
- power supply
- PCB and enclosure

For a wireless application, replace the PHY and RJ45 with a CompactFlash connector and a slightly larger CPLD.

In addition to a standard NetARM core (processor, SDRAM, Flash, PHY, RJ45 & magnetics), the items listed below indicate what basic circuit components are required to implement a WiFi and/or camera design. Prices listed are approximate 10K quantities.

Device	Cost	Needed for WiFi	Needed for Camera	Needed for WiFi + Camera
CPLD for WiFi	\$0.70	X		X
CPLD for camera	\$4.00		X	X
SDRAM for ChipWrights	\$8.00		X	X
CompactFlash connector	\$8.00	X		X
CompactFlash ejector	\$2.75	X		X
Omnivision camera sensor IC	\$11.75		X	X
Lens for camera sensor	\$TBD		X	X
Transceivers	\$2.00	X	X	X
Transceivers for WiFi	\$2.00	X		X

4. What you get and what you need

4.1 Development kit components

The Vista Camera & WiFi development board software package comes with the following:

- a. Vista board
- b. Complete runtime image of wired camera application
- c. Complete runtime image of wireless camera application
- d. Schematic of the Vista board in PDF and Orcad file formats
- e. Schematic and design files for the Xilinx CPLD
- f. Parts list (bill of materials) for the Vista board
- g. ChipWrights CW4011 datasheet
- h. Four hours of telephone and email support from Odic

4.2 Prerequisites

In order to have a fully functional wired or wireless camera development platform, you also need to purchase:

- a. NetARM-50 board P/N 1951000 Rev A
- b. Omnivision 2610AA (1600 x 1200) or 9620AA (1280 x 1024) camera sensor eval board
- c. NetARM JTAG programming tool

4.3 Optional items

In addition to the items listed as a prerequisite, additional tools available that can help you develop custom camera boards.

- a. Odic Vista software development package
- b. Xilinx JTAG programming cable
- c. NetSilicon NetOS 6 w/ WiFi drivers
- d. ChipWrights evaluation board (EVK)

See www.odic.com/networkcamera.html, www.chipwrights.com, and www.netsilicon.com/products/netarm.html for more information about these tools.

5. Licensing and royalties

There are no fees or royalties due NetSilicon, Odic, or ChipWrights associated with the electrical design files for the Vista board.