

# USB PORTABLE CONSOLE USING VINCULUM II TOOL CHAIN

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## ABSTRACT:

Under normal circumstances, if we want to copy or move data from one mass storage device to another, we use the computer as an intermediate device. When copying data is our only requirement, it is overkill to use a full-fledged computer to do something so mundane as to transfer data.

In this project, we have made a device which can eliminate the use of a PC or laptop for transferring the data of pen drive to another pen drive or any other USB device. This means you can also transfer data between pen drive, digicams, phone mass memory and other similar devices. Consider a USB flash drive in which you may have a large amount of data and you have the urgent need to copy this data into another flash drive. This can be done without any hassles by utilizing this gadget.

*Keywords - USB Flash Drive, FTDI Chips, VNCII, Portable Console, Interactive Console.*

## 1. INTRODUCTION

USB devices like pen drives, portable hard disks, digital cameras etc are widely used today. Every individual uses these devices to store and share important documents, images, songs, movies etc. But, to transfer the contents from one mass storage device to other, we need a computer. This is time consuming approach. Our idea is to build a portable console that can be used to transfer these contents from one USB device to the other, instantly without the need to start the operating system on a computer.

Flash drives have become the portable data storage devices of choice for students, independent technology consultants, remote workers and other mobile professionals. Increased storage capacities have made these flash drives capable of carrying high-capacity files such as videos, music clips and photos in addition to word processing documents, Spread sheets, PDFs and other files. Transferring data to any workstation using a flash drive needs the use of Laptop or Desktop and the transfer of data between pc's is not secured and for transferring data between pen drives in general we require to carry bulky PC or laptop .A USB storage device is that being a peripheral device, it needs a host, usually a Computer to initiate and mediate communications between two USB storage devices or other peripheral devices. As a solution to the USB Flash Drive disadvantage, the project aims to develop a device that allows file transfers between two USB memory devices without the need for a personal Computer. It is designed as a standalone application which allows for the backup of files from a digital camera or any USB device to another USB Device. The device makes use of FTDI's Vinculum VNC2.

Our proposed system makes use of VNC2-48LIA, a USB host controller that handles the USB protocols during file transfer. The VNC2-48LIA can be programmed for transferring contents from pen drive to pen drive . Along with this our proposed system will be interfacing an external buffer memory and a touch screen display which will allow the user to select the files to be transferred.

Section II describes the literature survey. The system definition is explained in section III. Implementation plan is explained in section IV. In section V, applications of our proposed system are mentioned. Expected outcome of our proposed system is given in section VI.

## 2. LITERATURE SURVEY

The presented paper will be working on the ideas given in the paper, "Data Transfer Between Two USB Disk Without Use of Computer" proposed by Subhash Suman, Prof.

A. A Shinde [1]. This paper provides the base idea for our proposed system.

The mentioned web page [2] provides us the information about Vinculum II tool chain.

The article “Innovation: USB-USB Data Transfer Device” by Shrenik Shikhare and his team [3] provides some information for the innovative idea of our proposed system.

Features of block diagram of VNC2 are mentioned on webpage [4].

The datasheet “VNC2 Debug Module” by Future Technology Devices International Ltd [5] mentions features and specifications of VNC2 debug module.

### 3. SYSTEM DEFINITION

#### 3.1 Overall System Architecture

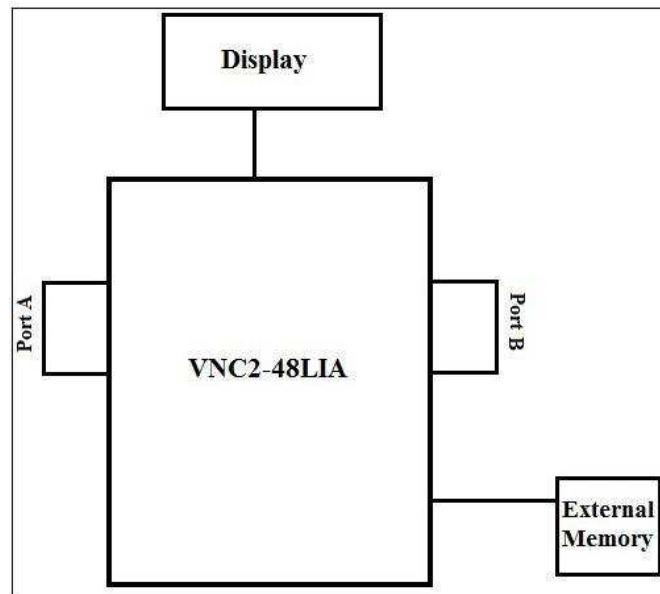


Fig 1: System Architecture

Fig. 1 describes the following parts of the console:

- (1) Vinculum Tool Chain VNC2-48LIA
- (2) External Buffer Memory
- (3) Touch Screen Display Device

#### 3.2 Detailed Description of the proposed system

The proposed system is going to help all those people who want to transfer data from one USB to another. The proposed system starts when the user inserts the transferring and receiving USB's

Now the user will be given a choice to select from which USB he/she wants to transfer the data. After selecting the transferring USB, the contents of selected USB will be displayed on the Touch screen display. From the displayed contents user selects the desired data he/she needs to transfer. The transferring data is first stored in the external buffer memory temporarily and from there the data is transferred to the receiving USB.

### 4. IMPLEMENTATION PLAN

#### 4.1 Hardware Requirements

Hardware requirements for our proposed system are as follows:

##### 4.1.1 Vinculum II tool chain

The VNC2 is the second of FTDI's Vinculum family of embedded dual USB host controller devices. The VNC2 device provides USB Host interfacing capability for a variety of different USB device classes including support for BOMS (bulk only mass storage), Printer, HID (human interface devices). For mass storage devices such as USB Flash drives, VNC2 also transparently handles the FAT file structure. Communication with non USB devices such as a low cost microcontroller is accomplished via UART, SPI or parallel FIFO interfaces. The VNC2 provides a new cost effective solution for providing USB Host capability into products that previously did not have the hardware resources available. The VNC2 supports the capability to

enable customers to develop custom firmware using the Vinculum II development software tool suite. The development tools support compiler, linker and debugger tools complete within an integrated development environment (IDE).

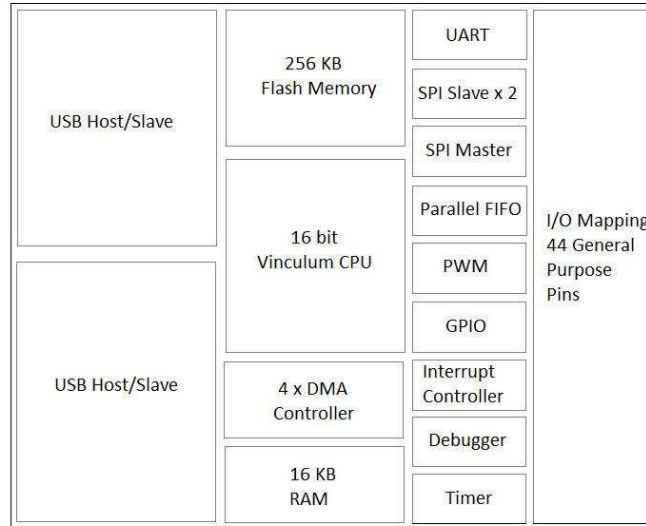


Fig. 2. Block Diagram of Vinculum II Tool Chain

The blocks of fig. 2 are explained below:

- USB Ports: 2 ports are given to attach USB from which one acts as an input and as another output.
- Flash Memory: Flash memory is a non-volatile memory storage device for computers and electronics. Flash can keep its data intact, with no power at all
- Vinculum II CPU: Its has processing powers
- DMA: Direct memory access (DMA) is a feature of modern computers that allows certain hardware subsystems within the computer to access system memory independently of the central processing unit(CPU).
- Random-access memory (RAM) is a form of computer data storage. A random-access device allows stored data to be accessed directly in any random order.
- A Universal Asynchronous Receiver/Transmitter is a piece of computer hardware that translates data between parallel and serial forms.
- The Serial Peripheral Interface Bus or SPI bus is a synchronous serial data link that operates in full duplex mode.
- Pulse Width Modulation, or PWM, is a technique for getting analog results with digital means.
- General Purpose Input/Output (GPIO) is a generic pin on a chip whose behavior (including whether it is an input or output pin) can be controlled (programmed) by the user at run time.
- The interrupt controller, Interrupt, provides a software interface to the interrupt system.
- A debugger or debugging tool is a computer program that is used to test and debug other programs (the "target" program).
- A timer is a specialized type of clock for measuring time intervals.

Features of VNC2:

- Uses FTDI's the VNC2-32Q embedded USB host controller IC device
- Two USB „A“ type socket to interface with USB peripheral devices
- UART, parallel FIFO and SPI interfaces can be programmed to a choice of available I/O pins
- Single 5V supply input from DIL connectors or 5V supplied via USB VBUS slave interface or debugger module.
- Auxiliary 3.3 V / 200 mA power output to external logic
- Power and traffic indicator LED's
- All VNC2 signals available on 0.6" wide / 0.1" pitch DIL male connectors.
- V2DIP2-32 is a Pb-free, RoHS complaint development module

- Debugger interface pin available on DIL pins or via 6 way male header which interfaces to separate debugger module
- Firmware upgrades via UART or debugger interface pin header
- FOC software development suite of tools to create customized firmware includes a
- Compiler, Linker, Debugger and Assembler all wrapped up in an easy to use Integrated Design Environment GUI.

#### 4.1.2 Touch Screen Display

A touchscreen is an electronic visual display that the user can control through simple or multi-touch gestures by touching the screen with one or more fingers. The touchscreen enables the user to interact directly with what is displayed, rather than using a mouse, touchpad, or any other intermediate device. The contents of the USB drive are displayed on the touch screen display. The user interacts with the contents which are displayed and appropriate actions are taken by the user according to his requirements. The progress of data transfer is also displayed on the touch screen display.

#### 4.1.3 External Buffer Memory

External memory which is sometimes called *backing store* or *secondary memory*, allows the permanent storage of large quantities of data. Some method of magnetic recording on magnetic disks or tapes is most commonly used. The capacity of external memory is high, usually measured in hundreds of megabytes or even in gigabytes (thousand million bytes) at present. External memory has the important property that the information stored is not lost when the computer is switched off. As the internal memory of the VNC2 is not sufficient for transfer of large data files, an external memory is used for temporary storage of data while transfer between 2 USB ports takes place.

#### 4.2 Software Requirements

The software utilized to develop the firmware is Vinculum Toolchain.

- (1) Vinculum Toolchain FTDI has created set of tools for VNC2 which includes a C compiler, assembler, linker, debugger and integrated development environment as shown in Fig.3. These tools facilitate application development on VNC2 using a kernel, device driver and runtime libraries provided by FTDI.

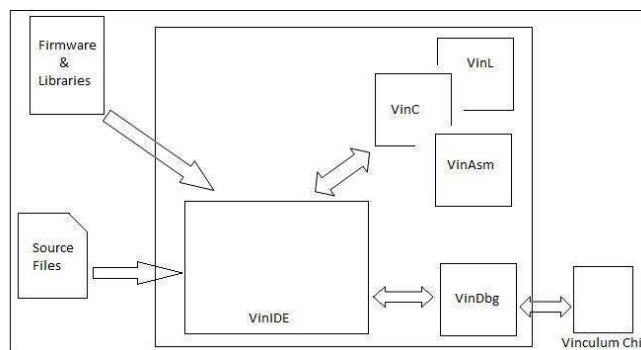


Fig. 3: Vinculum Toolchain

The tool chain is designed to integrate with the firmware which includes Real Time Operating System (RTOS), drivers and libraries supplied by FTDI. Addresses for ROM and RAM are handled differently. All ROM addresses are specified in word addresses as this is the size of data which is stored in the Flash ROM. All memory addresses are specified as byte addresses.

- (2) VinC Compiler

VNC2 C Compiler is a tool that generates machine code instructions. Input of compiler is a C source file which may contain standard C syntax. VNC2 C compiler (VinC) is a fully fledged C compiler developed for the VNC2 and it gives the developers the capability to quickly produce efficient code using C high level language. VinC is an ANSI C compatible compiler with built in language level functions to access the Harvard style memory architecture of VNC2 and I/O ports.

- (3) VinAsm Assembler

The assembler is a tool that generates hardware- specific machine codes for VNC2. It processes both directives and

instructions. The input of the assembler is an asm file which may contain comments, directives, instructions and white spaces. Normally, the assembler generates an object file which is in Executable and Linkable Format (ELF) format. If debug flag is enabled, the assembler generates debug information which is in DWARF2 format. For cases where problems occurred, error messages will be displayed and no object file will be created.

(4) VinL Linker

The Linker is a tool that generates single executable/loadable file after linking multiple object files provided by assembler and it supports archive file processing and DWARF2 compliant debug file generation. The input of linker is an Object file which is in ELF format. The output of linker is RAM, ROM and Binary Files. RAM and ROM files are generated for the Simulator. Binary file generated for Debugger and VNC2 programming.

(5) VinIDE

The IDE is a software application that provides comprehensive facilities to computer programmers for software development. The IDE consists of:

- (i) A source code editor
- (ii) A compiler
- (iii) A debugger
- (iv) VinIDE is an IDE that can be used to create user applications for the VNC2 chip. It has its own built-in source editor to write source files. It also allows building source files into the binary output by using the integrated tools in the tool chain namely:
  - (v) The Compiler (VinC.exe)
  - (vi) The Assembler (VinAsm.exe)
  - (vii) The Linker (VinL.exe)
  - (viii) The Debugger (VinDbg.exe)

**5. APPLICATIONS**

- USB Flash drive to USB Flash Drive file transfer interface
- Digital Camera to USB Flash drive
- Flash drive to SD Card data transfer

**6. EXPECTED RESULT**

The console which will be produced after implementing our proposed system will be with all those people who want to transfer data between two USB's without any use of intermediary.

**7. CONCLUSION**

This paper is about the hardware and software used to transfer a data from one USB Flash Disk to another Flash Disk without using bulky computers or Laptops. This paper puts light on eliminating the use of whole Computer just for a task to copy a data from one USB Drive to another. This device uses Vinculum VNC2 chip which provides USB Host interfacing capability for a variety of different USB device classes. Thus the goal of transferring the data from one pen drive to another pen drive without using computer or laptop can be achieved by using the principle described in this paper. The problems faced now will leave future work on the project with great possibilities. Further research on this paper can lead to the solution for the problems faced.

**8. FUTURE PLANS**

While working on VNC2 chip and interfacing it with Microcontroller we can easily add USB host capability to embedded products by little modifications following are the things which can be done.

1. GPS Interfaces.
2. We can transfer data using wireless technology such as Bluetooth.
3. USB Music media playback interface.
4. Designed to enable USB connectivity within a range of consumer and industrial applications.
5. Instrumentation and control systems.



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