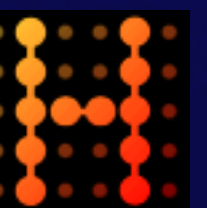


Crestron VC-4 Virtual Control

Using a USB-Serial Adapter with VC-4

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Crestron VC-4 Virtual Control

The Virtual Control Processor

- Crestron VC-4 is a Virtual Control Processor that runs under Red Hat Enterprise Linux, AlmaLinux, or Rocky Linux
- It allows use of a virtualized control processor for automation applications that would typically require an onsite PRO4, AV4, CP4, MC4 or other 4-series processor.
- Instead of local I/O devices, VC-4 communicates only with TCP/IP based devices. If communications is needed to local IR, IO, RS232/RS485, Relays, or Cresnet is needed, Crestron devices such as CEN-IO modules or CEN-CI3-3 card cages can be employed.

Crestron VC-4 Virtual Control

Crestron IO Expansion with VC-4

- CEN-IO-RY for Relays
- CEN-IO-IR for Infrared Control
- CEN-IO-COM for Serial Control
- CEN-IO-DIGIN for Digital Inputs
- CEN-CI3-1 and CEN-CI3-3 for card-based solutions
- DIN-CENCN-2 for Cresnet devices

Crestron VC-4 Virtual Control

Local Ports on VC-4 Host

- Crestron VC-4 does not currently support any local ports on the Linux Server itself
- But, Linux and other Unix variants provide many methods to interface disparate processes.
- So, it **is** possible to use a locally connected serial port on a VC-4 server from within a SIMPL or SIMPL# application running on VC-4.

Unix Philosophy

Tools, oh Modular Tools

- Since the beginning, Unix and its variants have embraced the concept of small, modular tools
- The idea is that a program should be able to accept input from another program, and that its output should be in a format that is acceptable to other programs.
- The most basic example would be the 'cat', 'pipe', and 'grep' commands.

Cat pipe grep mouse

whatis cat

- ‘cat’ is the command for writing the contents of a file to standard output. All it does is take the input provided (which might be the output of another program, not just a file) and print it out.
- so ‘cat *filename*’ write the contents of *filename* to your terminal
- ‘pipes’ are connectors - they direct standard output of one program to the standard input of another. They are not a standalone program on Unix, but built in and accessed using the | symbol (vertical bar).
- ‘grep’ is the command for searching for a string within a file or output of another program.

Cat *filename* | grep 'mouse'

now we're cooking

- so to dump the contents of a file into the grep command, and show us all of the occurrences of 'mouse' within the file, our complete command is:
 - `cat filename | grep 'mouse'`
- Most of you are already with me and understand this, but our little sidebar on Unix philosophy and piping serves a purpose. It leads us up to “How can we use a USB Serial Adapter with VC-4”

Device Pipes

Devices and Unix

- Different UNIX's had different methods of handling raw devices but all that I know of used special links within the /dev directory.
- Filesystems were mounted from the devices defined there, physical terminals had devices there, memory, CDRoms, tape drives, even things like the pseudo-random number generator can be found there.
- When a USB-Serial Adapter is plugged into the VC-4 host machine, a device will be created in that directory that provides access to that serial port.
- In the case of AlmaLinux, the device created for the first USB-Serial Adapter is /dev/ttyUSB0

VC-4 Can Not Access Server Hardware

No no no

- VC-4 is a Virtual Control Processor - it does not have any physical device access except Ethernet
- It can not directly access devices in the /dev directory
- But, it can access ethernet devices....
- so. what. if. we. made. a. serial. device. into. a. network. device?

A Network Serial Device

Let's go old school?

- Any of you that are old-school Crestron Programmers are likely familiar with devices like the Lantronix Network Serial Adapters. If you had an RS232-only device at one end of the house, and a CNMSX-PRO at the other end of the house, you could use a device like that to make the RS232-only devices reachable over the LAN.
- They were common in jobs that had old lighting processors such as Vantage, Litetouch, or Lutron that lacked Ethernet connectivity.
- Linux can do the same thing!

Skinning the Cat

not literally! Geez!

- Like almost anything in Unix Land, there are many ways to ‘skin the cat’.
- We are going to use a version of “netcat” (aka ‘nc’) called ‘socat’ which has more options and functionality.
- socat will allow us to create a “listening port” on TCP on the host machine, which allows your SIMPL/SIMPL# program to connected over the loopback address, and directly interact with anything plugged into the USB-Serial adapter.

Installing socat

Not included, easy to add

- AlmaLinux uses the 'yum' package manager so it is quick and easy to add 'socat'
- the command, which should be run as the administrator is
 - `yum install socat`
- Once installed, socat is immediately ready-to-use.

Easy Peasy

Let's connect to something

- The example program and touch panel provided assume that you have a FTDI USB-Serial adapter such as this one <https://amzn.to/3Scr6D3> attached to your instance of AlmaLinux, and it connected as /dev/ttyUSB0
- The example program assumes that you are using a Denon AVR, and the connection to the receiver is at 9600, 8N1. 'socat' can be used to adjust the baud rate, word size, and stop bits if needed. We are going to setup the host machine to listen on TCP Port 12345.
- To start up our socat network connection, we run the command:
 - `socat TCP4-LISTEN:12345,fork /dev/ttyUSB0,rawer,b9600`

SIMPL Windows

Crestron's Symbol-based Control Processor Language

- We'll set up a basic SIMPL Windows program that consists of a 4-Series Ethernet Processor, a TCP/IP Client, and a xPanel for testing.
- All available for your amusement at GitHub https://github.com/amosberg/VC4_Serial
- The TCP/IP Client is set to use IP address 127.0.0.1 and TCP Port 12345
- The program makes the ethernet connection to the awaiting socat client and is able to send commands and receive feedback from the Denon receiver

Key Part of the SIMPL Program

The TCP/IP Client and the loopback connection

