

The CfA Video Wall User Guide

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Introduction



A Barco Unisee video wall is available for presentations & scientific visualization in the Wolbach library.

The video wall consists of:

- A 3×3 array of monitors that creates a seamless large display (13.75' diag., 5760×3024 pixels), with almost no black space between each monitor.
- Each monitor is a 55" diag. LCD with a 16:9 aspect ratio and 800 cd/m^2 peak brightness.
- A tenth monitor, located on a rolling cart, adds a control screen and access to keyboard, mouse and docking of a laptop, etc.
- One of two computers can “drive” the video wall:
 1. a PC running Windows 10, pre-configured by the vendor, Barco, and
 2. a Linux server, running Rocky 8 and configured specifically for the video wall.
- A frame grabber, connected to the PC, takes any HDMI video input (like from a laptop) enabling the PC to display it on the video wall.

This UserGuide is available as web pages or as a PDF document.

Usage, Access and Liability Policies

Use of the video wall and its computers is subject to

1. The Smithsonian Acceptable Use Policies (SD-931);
2. Harvard Acceptable Use Policies (i.e. Policy, Policy Statements, and other links on that page);
3. The Wolbach Library Code of Conduct; and
4. common sense.

The video wall is to be used *solely* for work-related activities, and its usage shall conform to the Wall's Access & Liability Policy (PDF version).

The Wall is accessible during the library operating schedule, namely weekdays between 9am and 5pm.

If you wish to use it outside this schedule, make sure that you have scheduled access time: that request will trigger an exception to the procedure that automatically turns off the Wall outside this operating schedule.

Access Methods

Access to the video wall is open to all the members of the CfA community for presentations and/or scientific visualization.

To use the video wall for a presentation *only*, you will need to:

1. schedule your presentation by directly emailing the library (library@cfa);
2. have someone from the library (or the CF) give you access to the PC;
3. have your presentation in a format that the PC can display (see list of available software below); or
4. can use your own laptop, if it can generate an HDMI output, preferably a high resolution one.

To use the video wall for data visualization, you will need to:

1. request an account on either or both computers; and
2. complete a training session; or
3. request the reactivation of existing credentials; and
4. schedule access time by emailing the library directly (library@cfa).

Credentials on either machine will remain valid for 180 days, and will be renewed upon request.

Users of the video wall may **not**:

1. use the video wall without scheduling access time;
2. tamper with the hardware (like trying to gain access to the inside of the electronics rack, or changing any of the cabling); or
3. change any of the system's configuration or disable any of the system's protections, like the PC's anti-virus software.

If something is not working right please report it and, if needed, ask for help; also plan ahead, get familiar with the system during regular business hours when help is available and request specific software well in advance.

Note:

To request credentials, use this form.¹ To request the reactivation of existing credentials email the HPC Analyst (hpc@cfa).

The training material still needs to be developed.

Support

Support of the video wall falls under the HPC analyst's responsibilities (currently Sylvain Korzenik, hpc@cfa) and is managed following this Management Policy (PDF version).

While Sylvain was responsible for the system design, and is responsible for troubleshooting issues as they arise, as well as for issuing, renewing, and managing credentials, he is not available to provide immediate support.

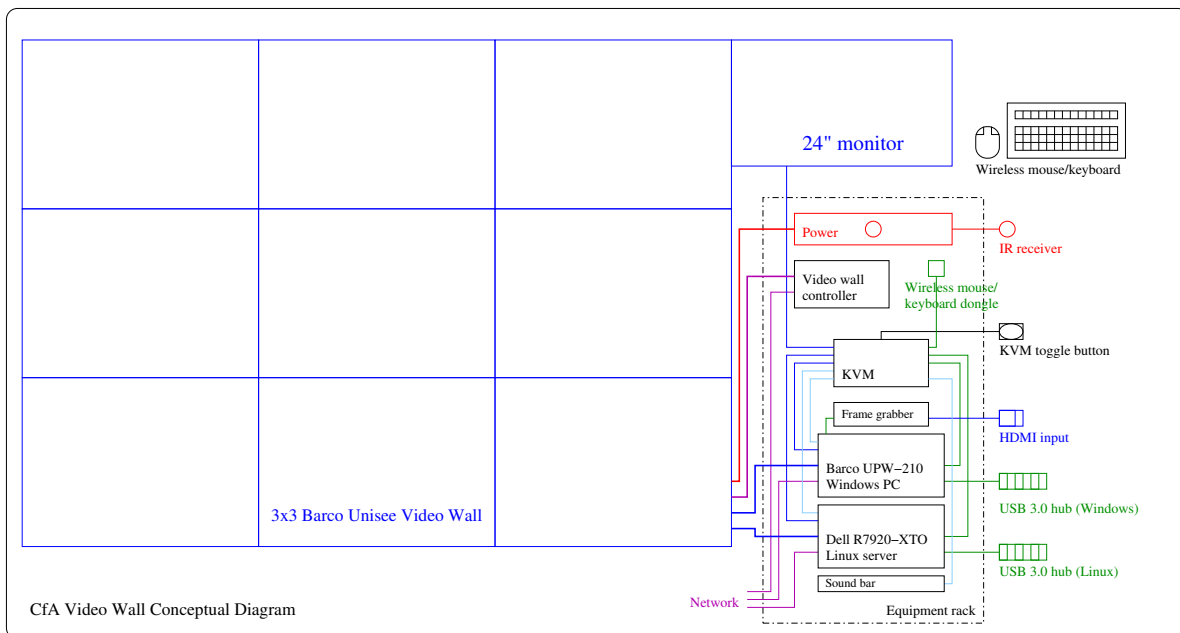
Some of the library (and the CF) staff are well-versed in the use of the video wall. If needed, and requested in a timely manner, they can and will provide support. They, in turn, will request Sylvain's assistance if and when deemed necessary.

¹<https://lweb.cfa.harvard.edu/sylvain/vwall/request-account.html>

Detailed Description

Hardware

The following figure is a conceptual diagram of the video wall system, although the actual cabling and equipment is more elaborate.



The video wall is “seen” as two displays: (i) a 24” display, set as the primary display, the one on the rolling cart, and (ii) a large display (5760×3024 pixels), located on the wall, and set as the secondary display.

For either computer, the smaller display extends the large one on its right and at the top, as shown on the conceptual diagram.

There are two dedicated computers whose video output can be fed into the video wall.

- One is a PC configured by Barco that runs Windows 10: a quad-core PC with 16GB memory, 256GB of SSD primary storage, a 2TB SSD as secondary storage, an NVIDIA quad-GPU and a frame grabber.
- The other computer is a mid-range server running Linux: a Dell Precision 7920 with a dual 16 cores CPU, 256 GB of memory, 8 TB of NVMe SSD storage and an NVIDIA quad-GPU.

Both computers are connected to the 24” display and the wireless keyboard and mouse via a KVM² switch that is controlled via a push button located on top of the electronics rack. This switch selects

²KVM stands for keyboard/video/mouse.

which computer is connected to the keyboard, mouse and the 24” monitor. There is no indicator to let you know the KVM setting (it’s hidden inside the rack), but then you only have two options.

A separate wall controller selects which computer video signal is fed to the wall (i.e., the large display).

Each computer is also connected to its own USB 3.0 hub. These are located on top of the electronics rack, and can be used to connect memory sticks, USB external disks, or other USB devices (and by-passing the KVM switch).

The PC is also connected to a frame grabber that accepts an HDMI video signal; it has the required software to display this signal on the wall. Hence, one can use a laptop, or any other device that can output an HDMI signal, and display it on the wall, although most laptop video signals won’t match the full resolution of the wall.³

Note:

The 24” display is also a touchscreen monitor, to be used in “tablet” mode, and used as a USB 2.0 hub connected to either computer via the KVM switch. The touchscreen works under Windows and Linux, but only on the 24” display. Under Windows, use [WINDOWS]+O keys to pop up a virtual keyboard; under Linux try double-tapping the screen.

A few additional accessories are available: a wireless mini keyboard and mouse system, a wireless “*air mouse*,” and a high resolution webcam with built-in mike (USB 3.0). These need to be connected to a USB port.

There is also a small sound bar (15W) inside the rack. That sound bar is turned off by default. It can be turned on by the library (or CF) staff if needed and deemed appropriate. The audio signal also goes through the KVM switch.

The KVM switch controls which computer is connected to (i) the keyboard, (ii) the mouse; (iii) the 24” display, (iv) the USB hub on the 24” display; and (v) the sound bar.

When not in use, the power switch of the keyboard (located on the upper edge, right side) and mouse (bottom) are in the off position (same for the other accessories). Make sure to turn both on to use them and off when done. If used, the sound bar should also be turned off when done.

Software

Both computers are *stand-alone* machines, connected to the network in the so-called “*self-managed*” subnet. Therefore, they do not have access to the resources available on either the CF- or the HEA-managed computers (like NETAPP disks, or various software and licenses available on these systems). They are configured and managed by the HPC Analyst.

The PC is running Windows 10 Enterprise with some visualization specific software pre-loaded. In order to maintain a working system, users will not be granted “*admin*” privileges and therefore won’t be able, in most cases, to install additional software.

³i.e., 4K is typically 3840×2160 pixels, which will fill a 2×2 subset of the wall, but the frame grabbed software can zoom out the HDMI signal to fill up the Wall.

The Linux server is running Rocky 8.5 (the successor to CentOS) with an installation specific for presentation & visualization on the video wall. Users will not be granted “*root*” privileges, but can install and run software as regular users.⁴

Reasonable and appropriately justified requests to install specific software on either computer should be sent to the HPC Analyst (hpc@cfa). Please allow at least one week for the software to be installed.

Users requesting licensed software will need to purchase a single node license for one of the dedicated computers, unless they can demonstrate that there is a CfA-wide need for it.

Disk Space

The disk space on either computer is not intended for long term storage. Disk space usage should be limited to video wall-related specific use. These computers should be considered public, hence no PII or confidential information will be stored on either machine.

Users are expected to delete their files when they are no longer needed, and should remember that the disks on either machine are not backed up.

Unless requested and agreed on, the content of the disks on either computer will be regularly scrubbed *without warning*, and users’ files will be deleted once the owner’s credentials have expired.

The large disk in the PC is called `E:/data` and large files should be stored in a directory on that disk, like under `E:/data/<username>`. The large disk on the Linux host is called `/data` and similarly large files should be stored in a directory on that disk, like under `/data/<username>`.

Network

While both machines are connected to the network, they “*live*” in a restricted subnet, the so-called “*self-managed*” zone.

It is recommended to use the USB 3.0 interface to copy data to and from either computer, although both can be VPN’d into the CfA trusted network domain using your VPN credentials, or you can use GMail, Google drive, etc.

Remember

Since the library is a public space, please screen-lock the computer(s) when leaving the library temporarily but **always** log off either computer when done.

Do not leave either computer screen-locked when you are done, and log off from any services you may have used, like GMail, Google drive, etc.

⁴Most Linux tools and packages can be installed as a non-privileged user, even if/when the instructions assume `sudo` rights.

How to Use the System

Reminders

- Please do not change either computer hardware or software configuration. If something is not working right, *ask for help* from either the library staff, the CF staff or Sylvain.
- If you plan to use the system after hours, test *during regular business hours* that your credentials are still valid, that you remember what to do and that all is still working for your needs.
- If you need any special software, contact Sylvain well ahead of time. If the installation of the software you will need requires admin (Windows) or root (Linux) privileges, you will not be able to install it yourself.
- If you are not familiar with the system, consider using it when someone that can help you is available, and contact that person ahead of time, and/or look back at the training material and this user guide.
- Do not use someone else's credential, do not use the system if you have not been trained, and do not try to open the electronics cabinet and/or change any of the cabling.

Giving Presentations

To use the system for giving a presentation, you will not receive any credentials. Instead you will need someone to log on the PC for you and give you access to the keyboard and mouse and any other needed accessory.

That same person will set the wall controller to display the video signal coming from the PC on the wall, as described below. If you also need audio, again that same person will turn on the sound bar for you.

You can use the PC like any other PC connected to two monitors in extended mode, except that one of these two "*monitors*" is big. You move windows between either display like you would normally, remembering that the small one is located to the right and near the top of the big one (and thus the big one to the left of the small one).

The only oddity is that some software will not work quite right when entering full screen mode: it may fill only one column instead of the whole wall. In this case, resize the window instead of maximizing it.


If your presentation material is accessible via a browser, simply start the one of your choosing. Otherwise, you can move you presentation material to the wall's PC like you would on any other PC.

One of the following methods will surely work:

1. Use a USB memory stick or an external disk, preferably USB 3.0. Connect it to a port on the USB hub labeled 'PC' (i.e. the one on the left). You can use FILESYNC to synchronize sets of files and/or directories.
2. Access your Google Drive, DropBox, etc., using any of the browsers. Remember to log off your Google, DropBox, etc., account when done.
3. To copy using the `scp` protocol, start VPN if needed, and use WINSCP.

If you need to use any tool from the MICROSOFT OFFICE suite, use the stand alone OFFICE 2016 version. If you opt to use OFFICE 365, remember that this is a public machine with a shared login, so do not associate your OFFICE 365 credentials with this PC and make sure to log off.

If you use your own HDMI-capable device (like a laptop), make sure you have the right dongle if your device/laptop does not have an HDMI connector (although the library or the CF *might* have the one you need).

Simply connect the HDMI cable (on the rolling cart) to your laptop and start the VIDEO CAPTURE PLAYER, , on the PC from the shortcut located on the toolbar.⁵

This will open a window and show on the wall your device/laptop's video output. You may need to properly configure your device/laptop video to either get a signal or set it to the optimal resolution.

If you get an error message like VIDEO CAPTURE PLAYER IS RUNNING, check in the Windows icon tray (lower right) and maximize (open) the VIDEO CAPTURE PLAYER since it is already running but minimized (hidden).

Data Visualization

Either computer can be used for data visualization, depending on the software you plan to use. The Linux server is a more powerful computer with fast local disks.

Users who wish to use the Wall to explore, visualize and analyze large and complex data are welcome to request credentials on either computer.

⁵The VIDEO CAPTURE PLAYER is located in
C:/Program Files (x86)/AVerMedia/AVermediaPreviewSDK/Bin/AVMIcon.exe, VLC can also display the frame grabber signal.

Computer Selection

You can select which computer is connected to the keyboard, video and mouse (aka KVM) via a push button KVM switch. That button is located on the top right side of the electronics rack.



There is no visible indicator of which computer is connected (it's hidden inside the rack), but you have only two options. Also, double check that the switches on the keyboard (upper right) and the mouse (bottom) are on.

The KVM controls the keyboard, the mouse, the sound bar, the 24" control monitor (the one on the cart) and the monitor's USB hub (not the ones on the cart). Which computer displays an image on the video wall is controlled by an app, the WALL CONTROLLER, see below, that controls whether the Wall is on or off (technically idle), its brightness and which computer output to display on the Wall.

Wall Controller

The WALLCONTROLLER allows you to control the video wall as follows:

1. toggle which computer is displayed on the wall,
2. turn the wall monitors to 'On' or 'Idle', and
3. change the wall LCDs brightness.

GUI Tool

One way to do this is to run the GUI version of the WALLCONTROLLER.

On the PC, it can be started via the WALLCONTROL shortcut on the desktop or in the taskbar, and selecting the START-WALL-CONTROLLER (📄) shortcut. If for some reason neither is present, use WINDOWS FILE EXPLORER and go to `C:/Program Files/VideoWall/Tools/WallControl`.

On the Linux server, it can be started with the `wall-controller-gtk` command after module load `wall-controller`. Usage for `wall-controller-gtk` is

```
-verb          set verbose mode (can be repeated)
-nocomm       disable communication with BCM (debug mode)
-host <hostname> specify BCM hostname
-port <#>     specify port number
-h -help --help show this help
```

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This will start the following window, with an intuitive GUI:



The help file, available under “*Menu*”, explains it all:

Menu:

Refresh: read the wall status,

Help: show this help,

Quit: exit this app.

Buttons:

Source: select which computer is shown on the wall.

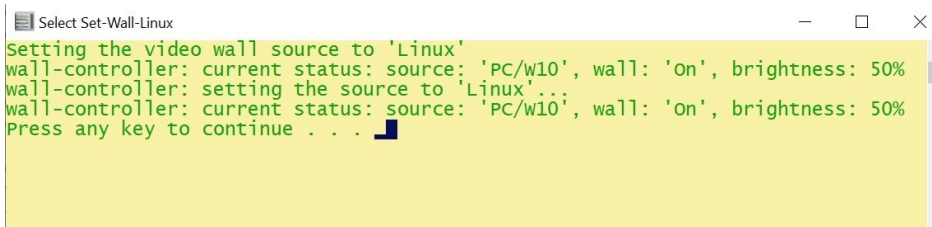
Wall: show/toggle if the video wall is 'On' or 'Idle'.

Brightness: show the wall brightness, adjust it with the [--], [-], [+] or [++] buttons, then use the [set] button to change its value.

Non-GUI Tools

Alternatively, on the PC, you can use one of the four SET-WALL-XX shortcuts, where XX stands for PC, LINUX, ON or IDLE, to select which computer is shown on the wall or toggle the video wall to 'On' or 'Idle'.

These will open a window that looks something like this:



```

Select Set-Wall-Linux
Setting the video wall source to 'Linux'
wall-controller: current status: source: 'PC/w10', wall: 'on', brightness: 50%
wall-controller: setting the source to 'Linux'...
wall-controller: current status: source: 'PC/w10', wall: 'on', brightness: 50%
Press any key to continue . . .
  
```

that you then need to dismiss by selecting the window and pressing the [ENTER] key.

On the Linux server, you can use the wall-controller command after module load wall-controller. Usage for wall-controller is

```

-s|--source value      set source to given value: pcw10|linux, value can be abbreviated
-w|--wall state        set wall to given state: on|idle, value can be abbreviated
-b|--brightness value  set brightness to given value: 0-100
-v|--verbose           set verbose mode (can be repeated to increase verbosity)
-r|--raw               set raw (unformatted) output
-n|--nocomm            disable communication with BCM (debug mode)
-host <hostname>      specify BCM hostname
-port <#>              specify port number
-h -help --help       show this help
  
```



SGK ver. 1.0/5

Note

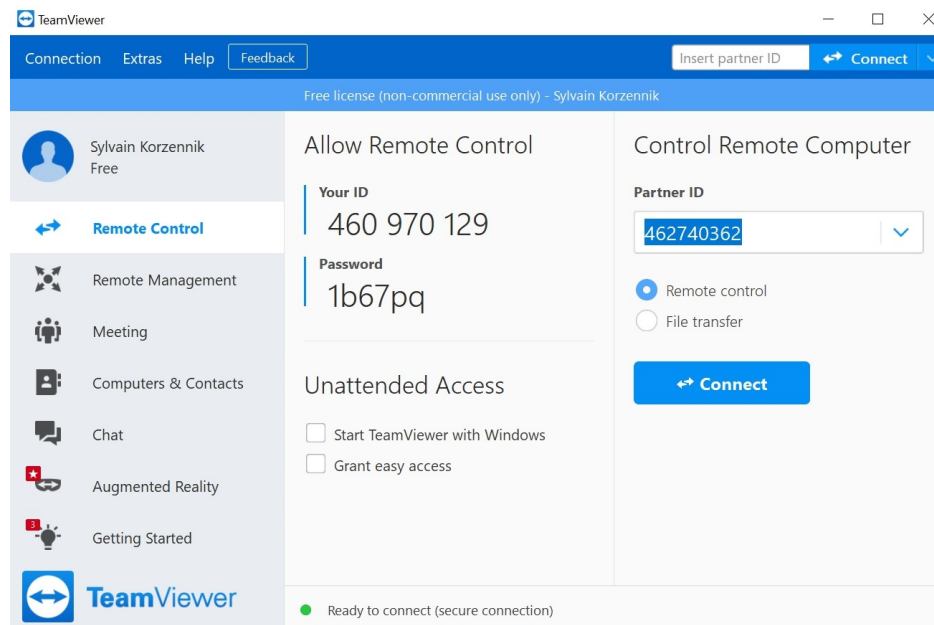
The WALLCONTROLLER can be installed on any laptop running Windows 10 (or Windows 8) that can VPN into CfA, or can be run on a CF-managed Linux machine, or on an Android device that can VPN into CfA (sorry no Apple products). Contact Sylvain if you'd like to know how to do either.

Enabling Remote Access on the PC

To enable remote access for help and troubleshooting, when asked by Sylvain, start TEAMVIEWER (not to be confused with MS TEAMS).

You can find TEAMVIEWER, , under the 'T' section by clicking on the  icon, or pressing the [WINDOWS] key.

Select REMOTE CONTROL on the left panel of TEAMVIEWER, as show below:



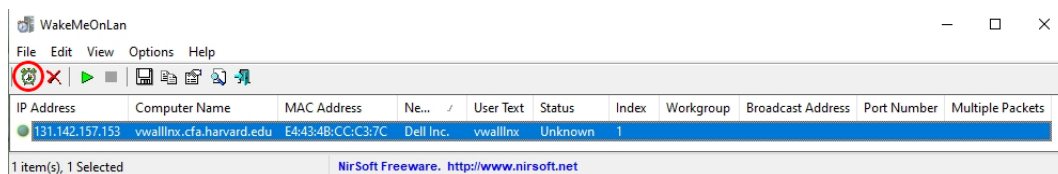
and then give to the remote person the ID and the Password displayed in the TEAMVIEWER window, (i.e. 460 970 129 and 1B67PQ in the example above). This will allow the remote person to take control of the PC. Exit TEAMVIEWER when done.

Using the Linux Server

The Linux server, `vwalllnx.cfa.harvard.edu` is a powerful yet noisy computer, so it is set to “*hibernate*” when not in use.

To use it, you need first to request credentials, and a training session will be scheduled. Each time you plan to use it, you will need to (1) wake it up, (2) set the Wall to Linux and turn it on, and (3) set the KVM to Linux, as follows:

- The library public PC has a “folder” named WALLCONTROL, with shortcuts to WAKEUP-LINUX-SERVER, WALLCONTROLLERGUI and PUTTY.
- To wake up the Linux server, use WAKEUP-LINUX-SERVER to start the WAKEMEONLAN program; select the one entry `vwalllnx.cfa.harvard.edu`, click on the alarm clock button located on the upper left, and confirm that you wish to wake up that computer:

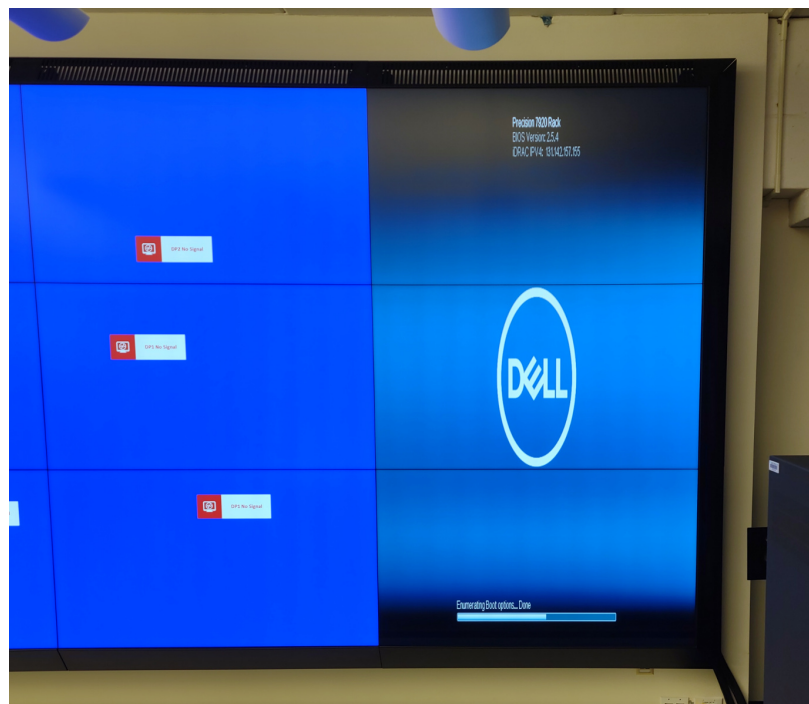


A few seconds later you should hear the server’s fans noise as it is booting up. The fans will speed up and the noise will go up at first, the settle down.

Please do not change that program configuration.

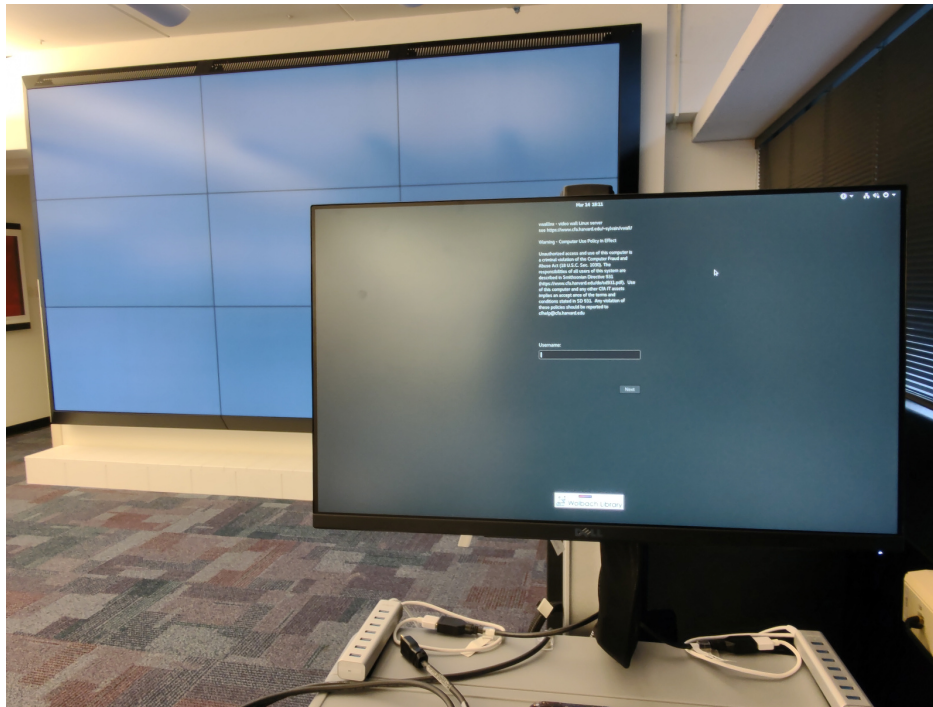
- The next step is to use the WALLCONTROLLERGUI program, on either the Wall PC or the library public PC and set the Wall to Linux.

The monitors on the Wall will all turn blue at first and after a couple of minutes you should see that the Linux machine is booting:



- Once you see that booting screen, use the KVM switch to toggle to Linux, the 24” monitor will turn and stay black for a while (if you do this too early, the KVM switch might auto-switch back to PC mode).

There is no need to type anything, let the booting procedure to complete. It will take close to 5 minutes to complete, until you see the following:



Once you see the login screen, log in with your credentials.

It is recommended that the first time you log on `vwalllnx.cfa.harvard.edu` you use the command `source /usr/local/bin/gnome-init-config` to initialize your gnome configuration.

When you are done using the Linux server, we ask you to put it back to “*hibernation*” as follows: (1) log into `vwalllnx.cfa.harvard.edu` using `ssh` (or `PUTTY` on the library public PC) and (2) type `set-host-to-sleep` and confirm by typing ‘yes’.

You should see something like this:

```
[guest0001@vwalllnx ~]$ set-host-to-sleep
This script will set vwalllnx.cfa.harvard.edu to sleep (hybrid-sleep)
are you sure [no/yes]? yes
+ Tue Mar 15 17:39:48 EDT 2022 guest0001 is setting vwalllnx.cfa.harvard.edu to sleep (hybrid-sleep)
= Tue Mar 15 17:39:48 EDT 2022 done, the computer will be "sleeping" in a minute or so.
Log off now...
```

You will need to log off promptly or kill your `ssh` (or `PUTTY`) session.

Software Available on the PC

The PC computer runs Windows 10 Enterprise, with the usual slew of software suites. The following list of software is available:

- OFFICE 2016, recommended over using OFFICE 365.
- BROWSERS – Chrome, Firefox, Edge.
- VPN – Cisco AnyConnect.
- ACROBAT READER, PHANTOM PDF – PDF viewers.
- VLC – recommended media player.
- PUTTY, WINSCP, FILESYNC – ssh, scp and file synchronization.
- ZOOM, MS TEAMS – video conferencing tools.
- TEAMVIEWER, VNC – remote access tools.
- GIMP, GHOSTSCRIPT – images and postscript viewer/editors.
- SCREEN GRAB PRO – screen grab tool.
- CYGWIN – Unix implementation under Windows that offers a fully functional X server.
- EMACS – *the* kitchen sink editor.
- WGET – Windows equivalent of Unix `wget`

Shortcuts to most tools are available in `C:/Program Files/ToolsShortcuts`, and the `TOOLSSHORTCUTS` shortcut on the desktop and the taskbar.

Software Available on the Linux Server

The Linux server runs Rocky 8.5 (the “successor” to CentOS) with an installation customized for the need of the video wall, hence it is not equivalent to the CF or HEA installations.

Most of the “classical” Linux tools have been loaded with a few visualization specific additions, like `ds9`, `vlc`, `ggobi`, `idl`, `julia`, `visit`. Cisco AnyConnect is available, but the CFA VPN is currently not working on a Linux machine⁶, other tools like `chrome`, `acroread`, `xv`, `xpdf` have been loaded.

Feel free to contact the HPC Analyst (`hpc@cfa`) to request additional software.

Access to some tools require loading the corresponding module, check the man page for the command `module` and use `module avail` and `module help` to learn more.

⁶As of March 2022, accessing the CfA VPN from a Linux machine fails with a `Authentication failed` due to problem navigating to single sign-on URL message, a “*known problem*” according to the CF.

FAQ

This is still missing.