MT CANVUS 1.2.2
INSTALLATION MANUAL
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This manual is intended for the owners and operators of MT Canvas. It contains guidelines for the proper usage of the product. Information in this manual is subject to change without prior notice to product owners. For the latest product details and guidelines please visit the product website.

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1 Introduction

MT Canvus is an engaging and intuitive software solution for interactive video walls. It helps organizations to visualize big data, socialize ideas, educate clients and work collaboratively.

Multiple users can work on a video wall at the same time, using their hands, fingers and infrared pens to interact with screen content. MT Canvus also allows users to share content from their smart devices onto the video wall and, conversely, to share content from the video wall onto external monitors, projectors, or virtual webcams.

By encouraging users to collaborate to develop and circulate new ideas, MT Canvus can boost productivity and accelerate business processes.

*MT Canvus on an interactive video wall*
2 Set up the application computer

This section describes various tasks that need to be performed to deploy MT Canvas.

2.1 About the application computer

The application computer is an external computer that runs MT Canvas and, if required, other touch-enabled applications including Cornerstone-based applications and TUIO-based applications. The application computer receives tracking data from the tracking computer, and sends video data back to the Cell for display on the LCD screen.

2.2 Recommended computer specification

This section presents the recommended specification for an application computer running a standard Meeting Room solution with three Cells:

- **OS**: Ubuntu 14.04 LTS distribution
  
  **Important**: MT Canvas application computers only run on a Linux operating system using the Ubuntu 14.04 LTS distribution. You can find installation instructions and OS images at [www.ubuntu.com](http://www.ubuntu.com).

- **GPU**: PNY-supplied NVIDIA Quadro K5200, 8GB. PNY part no. VCQK5200-PB.

- **Case and motherboard**: Supermicro SuperWorkstation 5038A-iL Xeon E3 2x1000T 8*SATA 500W(86%)

- **CPU**: Intel Xeon E3-1271V3 4-core Haswell 3.6 GHz 8 MB LGA1150 80 W

- **Memory**: 2x 8 GB 72-bit registered ECC DDR4 SDRAM DIMM 2133 MHz PC4-17000

- **Hard drive**: SSD 480 GB Samsung SM843Tn MLC SATA/6Gbps 2.5” R/W 530M/340M IOPS 79k/13k DWPD 1.8

- **Capture Card**: Datapath VisionAV-HD 2 Channel DVI/ RGB/ HD

  (The capture card is needed for processing video input into the application computer from an external device or computer.)
2.3 Connect the application computer

Before you install MT Canvus, connect the application computer to the video wall and to the internet.

2.3.1 Video connections to the Cells

**Note:** This section assumes that the application computer is using the recommended NVIDIA Quadro K5200 graphics card; see section 2.2.

Connect a cable from the video outputs on the application computer’s graphics card to the DVI-D video inputs on the Cells in your video wall. You will need to use adapters or converter cables for the DisplayPort to DVI-D connections. Ensure there is no stress or tension on the connected cables. After connecting all cables, connect the Cells and application computer to the mains supply.

If you are deploying the MultiTaction Meeting Room solution, you must connect the video connections exactly as shown below:

**Video connections for Meeting Room solution.**
1 Application computer, 2 NVIDIA K5200 graphics card, 3 I/O bracket, 4 Meeting Room video wall, viewed from front.

- DP1 DisplayPort 1 connects to Cell #1.
- DP2 DisplayPort 2 connects to Cell #2.
- DV1 DVI port 1 connects to Cell #3.
2.3.2 Network connections to the Cells and internet

Note: This section refers to the rear connection panel on the recommended Supermicro SuperWorkstation; see section 2.2.

Establish network connections between the application computer and the Cells in your vide wall. You must also connect the application computer to the internet.

- **Internet:** Connect the top Ethernet port (em1) to your default gateway.
- **Cells:** Connect the bottom Ethernet port (em2) to the switch provided with the Meeting Room solution. Then connect each Cell to the switch.

2.3.3 Configure network settings for each Cell

Configure the network settings for each MultiTaction Cell. Using the on-screen display (OSD) on each Cell in turn, configure the following network settings:

- **Type** Manual
- **Address** 10.77.84.10x. See below.
- **Netmask** 255.255.255.0
- **Gateway** 10.77.84.1
- **DNS** 8.8.8.8

When you view the Cells from the front, configure their network addresses to:

- **Cell 1** 10.77.84.100
- **Cell 2** 10.77.84.101
- **Cell 3** 10.77.84.102

Tip: To find these settings, display the OSD and tap the Setup tab. Then go to the Network pane. For details about the OSD, see the MultiTaction Cell User Manual.
2.4 Install MT Canvus from a disk image

Note: This section describes the setup procedure for the MultiTaction Meeting Room solution using preconfigured disk images. For manual installation instructions, see section 2.5.

MultiTaction provide preconfigured disk images for the standard Meeting Room solution. This solution comprises three MultiTaction MT555 Cells in portrait mode plus an application computer with the specifications given in section 2.2. Each disk image includes a preconfigured Ubuntu 14.04 LTS operating system running a pre-installed version of MT Canvus.

You will need to write the image to a USB disk and then boot the target computer from that USB disk. When the application computer boots from the USB disk, its hard disk is automatically erased and overwritten with the standard Meeting Room solution software setup. Any existing information on the hard disk is erased.

2.4.1 Write the MT Canvus image to a USB disk

Your MultiTaction representative has provided you with a preconfigured MT Canvus image. Write this image to a USB disk. On Linux computers, you can do this with the following command:

```
zcat <image> | sudo dd of=/dev/<usb device> bs=4M
```

For example, if your USB device is /dev/sdg, use this command:

```
zcat mt-canvus-1.0.2.rewriter.nvidia.img.gz | sudo dd of=/dev/sdg bs=4M
```

Note: If you do not have an MT Canvus image, contact MultiTaction Support for advice: https://www.multitaction.com/support-services

2.4.2 Boot the target application computer from the USB disk

Connect the USB disk to the target application computer. Then reboot the application computer. The PC image will automatically detect the correct hard disk and overwrite it. After the process is completed, the application computer will beep and shut down automatically. Remove the USB disk and restart the application computer.

2.4.3 MT Canvus launches automatically

When the application computer restarts, MT Canvus launches automatically.

Now configure the network settings; see section 2.6.
2.5 Install MT Canvus manually

*Applies only if you did not use the preconfigured disk images.*

2.5.1 Obtain the MT Canvus software

1. Register on the MultiTaction Cornerstone web site:
   
   https://cornerstone.multitouch.fi/

2. Contact MultiTaction Support and request access to the Downloads page.

3. Log on to the MultiTaction Cornerstone web site (see step 1).

4. Browse to the Downloads page
   
   https://cornerstone.multitouch.fi/canvas_download

5. Download the MT Canvus software installer.

2.5.2 Install the MT Canvus software

1. Execute the installation script with sudo. For example:
   
   sudo sh mt-canvus-1.0.2-build197_Ubuntu-14.04-20150921-876190f-ee96280.sh

2. The software is installed under /opt/mt-canvus-<version>.

   Make a note of this location. You will need to know this location if you later need to edit the mt-canvus.ini configuration file.

3. Start the MT Canvus application with the scripts in /opt/mt-canvus-<version>/bin.

   These are added to PATH automatically.

   - To start the MT Canvus application integrated into Experience, run:

     experience.sh [arguments]

     Please contact MultiTaction Support for details about the required command line arguments.

   - To open a standalone version of MT Canvus without Experience, run:

     mt-canvus.sh

Now configure the network settings; see section 2.6.
2.6 Configure network settings for the application computer

Configure the network settings for the MT Canvus application computer.

1. Access the desktop: see section 4.1.1.

2. Click the Network Manager icon in the top-left corner of the desktop and choose Edit Connections.

3. Edit the network settings as required. For example, you may want to specify the IP address of the application computer, the default gateway or DNS server.

4. Return to MT Canvus; see section 4.1.2.
3 Administration commands: mt-canvas-setup

Meeting Room solutions include mt-canvas-setup, a command line admin tool. You can use this tool to perform various maintenance and configuration tasks.

To see the full list of available commands, run either of the following:

mt-canvas-setup --help
mt-canvas-setup -h

The following commands are available:

- **Version commands:** Meeting Room solutions can have multiple versions of MT Canvas software installed concurrently. You can run commands to:
  - List the installed versions.
  - Display the active version i.e., the version that starts automatically.
  - Select the active version.
  - Display the version of the mt-canvas-setup tool.

- **Software update commands:** You can run commands to:
  - List the available MT Canvas software updates.
  - Download and install a specific version
  - Automatically update to the latest version and make this the active version
  - Uninstall a specific version.

  **Note:** These commands require an internet connection.

- **Remote access commands:** Remote access to the application computer is disabled by default, but you can run commands to:
  - Enable remote access.
  - Set up remote access using OpenVPN and ssh.
  - Disable remote access via OpenVPN and ssh.
  - Display the host id of the application computer.
  - Automatically assign a unique hostname to the application computer based on its host id.

  **Note:** When remote access is enabled, password authentication is disabled by default, but public key authentication can be used. MultiTaction Limited stores the public and private keys.
4 Customize the setup

If the standard computer setup needs to be customized (e.g., with different screen layouts or network configuration), you can do this after the base image has been written to the computer. You can find a set of configuration presets on the application computer in:
/usr/share/mt-canvus-setup/templates

4.1 Desktop access

This section describes how to access the MT Canvus desktop.

From the MT Canvus desktop on the application computer, you can: launch an editor to update mt-canvas.ini; launch a terminal emulator to run command line operations; edit the network settings.

4.1.1 Access the desktop

The method for accessing the desktop depends on how you installed MT Canvus:

- **If you installed a preconfigured MT Canvus image**
  
  Press Ctrl+Alt+Esc to shutdown MT Canvus and access the OS desktop. This method prevents MT Canvus from restarting automatically.

- **If you installed MT Canvus manually**
  a. Press Ctrl+Q to access the OS desktop.
  b. Press Ctrl+C to stop the mt-canvus.sh script. (This prevents MT Canvus from restarting automatically.)

4.1.2 Return to MT Canvus

To re-launch MT Canvus, right-click the desktop and choose ‘MT Canvus (auto-restart)’ from the pop-up menu.

4.2 Configuration file: mt-canvas.ini

MT Canvus reads settings from a configuration file, mt-canvas.ini. This file uses a standard INI file format. For an example, see:
https://cornerstone.multitouch.fi/sites/default/files/generated-content/canvus/mt-canvas.ini

4.2.1 Where is mt-canvas.ini?

The location of mt-canvas.ini depends on how you installed MT Canvus:

- If you installed a preconfigured MT Canvus image, find mt-canvas.ini here:
  /home/multi

- If you installed MT Canvus manually, find mt-canvas.ini in your chosen MT Canvus installation folder.
4.2.2 Pass mt-canvas.ini to MT Canvas

If you installed a preconfigured MT Canvas image, mt-canvas.ini is passed automatically.

If you installed MT Canvas manually:

1. Access the desktop: see section 4.1.1.
2. Right-click the desktop and launch a terminal emulator.
3. Run the following command:
   
   ```
   mt-canvas.sh --mt-canvas-config <file location>
   ```

   Where `<file location>` is the location of `mt-canvas.ini`. For example:
   
   ```
   mt-canvas.sh --mt-canvas-config /home/multi/mt-canvas.ini
   ```

   If MT Canvas is run inside MultiTaction Experience, pass the same command-line argument to Experience and it will be picked up by the application.

4.2.3 Customize the MT Canvas background

The canvas background can be customized in `mt-canvas.ini`. See the background-init setting under the Canvas settings section.

An example JavaScript file to replace the standard canvas background with the MultiTaction Experience background can be seen here:

```
https://cornerstone.multitouch.fi/sites/default/files/generated-content/canvas/experience-canvas-background.js
```

4.3 Specify the time zone

1. Access the desktop: see section 4.1.1.
2. Right-click the desktop and launch a terminal emulator.
3. Run the following command to specify which time zone the MT Canvas application computer will use:
   
   ```
   sudo dpkg-reconfigure tzdata
   ```
5 Enable image searches

Note: If you installed MT Canvus from a preconfigured disk image (see section 2.3), images searches are already enabled. You can therefore skip this task.

MT Canvus enables users to visualize concepts and ideas. Such visualization is heavily dependent on the use of images. The fastest way for end-users to add images to the canvas is by enabling Google-based image searches in the Search widget. This will allow users to quickly enter the search terms and drag any resulting images onto the canvas.

![Search widget](image.png)

1. Type the search terms here.
2. Image Search hotspot.
3. Web search hotspot.

5.1 About Google Custom Search

MT Canvus supports Google-based internet searches. In MT Canvus, users run these searches by launching the Search widget from the Finger menu.

However, image searches are disabled by default in the Search widget. To enable image searches, you must create a custom search engine based on the Google Custom Search API. For details, see the Google Developers web site:

https://developers.google.com/custom-search/docs/overview#what_is_custom_search

5.2 Configure MT Canvus to use a custom search engine

First, you must enable the Google Custom Search API and get an API key for MT Canvus. Then you need to create a custom search engine. For full details, see the Google Developers web page:

https://developers.google.com/custom-search/docs/overview

Follow these steps:

1. To use the Custom Search API, you need an **API key**. In turn, you need a **project** to enable an API key. Therefore, you must:
   a. Go to the Google API Manager:
      https://console.developers.google.com/apis/library
   b. Create a project.
   c. Enable the API.
d. Create your API key (do this on the Credentials page of the API Manager). An example key is shown below:
   AIzaSyDOVaSQQGJiV8XbK5ggz9jPRTE6Z44eTXAs

e. Make a note of the API key.

   **Note:** Google limits the number of free searches per application per day. You must therefore create your own API key for MT Canvas and set up a billing plan if you need to run additional searches.

2. Browse to the following URL and create a custom search engine based on the source URLs you want.
   [http://cse.google.com/manage/all](http://cse.google.com/manage/all)

3. While still on your Google Custom Search page, go to the control panel for your new search engine. Then:
   a. Enable Image Search.
   b. Make a note of the search engine ID. An example ID is shown below:
      006952931205789975933:vlaia71xrb
   c. If required, you can add search engine keywords and modify the list of sites to search for images.
   d. Make any other changes you require. For example, you can add a name and description for your search engine.
   e. Click Update to save the changes to your custom search engine.

4. Add your API key and search engine ID to `mt-canvus.ini`. For example:

   ```
   [image-search]
   api-key=AIzaSyDOVaSQQGJiV8XbK5ggz9jPRTE6Z44eTXAs
   engine-id=006952931205789975933:vlaia71xrb
   ```
6 Enable screen sharing

The screen sharing feature enables users to display the screen of their laptop on the canvas. This section describes how to set up screen sharing in MT Canvus. For full details about screen sharing, see the *MT Canvus User Guide*.

6.1 Share your laptop screen with MT Canvus

**Terminology:** *For simplicity, the instructions below refer to ‘your laptop’ when describing the external device that shares its screen on the canvas. Although this external device is generally a laptop, screen sharing is supported from any compatible device including desktop computers, tablets, and cell phones.*

Follow these steps:

1. Establish a video connection between your laptop and MT Canvus:
   a. Connect your laptop to the application computer, using either a wired or wireless connection; see section 6.1.1.
   b. Canvus automatically detects the incoming video stream and adds the laptop to the list of available screens in the Screen Share system menu.

2. In MT Canvus, tap the Screen Share system menu.

3. The menu lists the available shared screens. Tap the option for your laptop.

*Screen sharing. 1 Screen share menu, showing two available shared screens. 2 Shared screen widget. 3 Remote Control Info button; see section 7.3.*
6.1.1 Screen share connection methods

You can use wired and wireless connections between your laptop and the capture card installed on the MT Canvus application computer.

- **Cable connection:** Use a suitable cable and, if required, adapter to connect the video output on your laptop to the video input on the capture card.
  
  **Note:** The capture card recommended by MultiTaction has two DVI inputs. If your laptop has, for example, an HDMI or DisplayPort video output, you will need to use a suitable adapter or converter cable.

- **Wireless connection:** Use a Barco ClickShare device for one-click screen sharing. Briefly, the setup steps are:
  
a. Connect the ClickShare base unit to a video input on the capture card.
    
    **Note:** Depending on the model, the base unit typically has VGA and HDMI video outputs. Because the recommended capture card recommended has two DVI inputs, you will need to use a suitable adapter or converter cable.
    
    (Applies only if you chose a VGA video connection in the previous step) If you require an audio connection from your laptop to the canvas, you will need to connect a separate 3.5mm audio cable to the capture card.
    
    **Note:** You do not need a separate audio cable if you chose an HDMI video connection in the previous step.
  
b. Connect a ClickShare button to a USB port on your laptop.

![Example Barco ClickShare base unit (1) and two ClickShare buttons (2)](image)

c. Click the ClickShare button to share your laptop screen with MT Canvus.

For full setup details, please refer to your Barco ClickShare documentation, available to download on www.barco.com.
6.2 Datapath VisionAV-HD capture card

The screen sharing feature uses a video capture card installed on the MT Canvas application computer. This section briefly introduces the recommended capture card.

We currently recommend using the Datapath VisionAV-HD capture card: http://www.datapath.co.uk/products/video-capture-cards/visionav-range/visionav-hd

Datapath Vision AV-HD capture card with dual DVI inputs

MT Canvas application computers only run on a Linux operating system. The Datapath capture card requires a specific driver for Linux. This driver is pre-installed in the MT Canvas image for the Meeting Room solution; see section 2.3.

If you need to install the driver manually (for example, because you are not using the preconfigured MT Canvas disk images), you must:

1. Manually install the MT Canvas installation package; see section 2.5.
2. Run the following command:
   ```
   sudo apt-get install vision
   ```
   Where `vision` is the apt package containing the necessary driver.

   **Note:** If you subsequently upgrade the Linux kernel after installing the capture card driver, the driver is recompiled and re-installed automatically. No further setup is required.
7 Enable remote touch

The remote touch feature allows touch operation of applications running on Windows computers that are sharing their screen with MT Canvas.

For example, a team is using MT Canvas to plan a new product. A team member is running a touch-enabled spreadsheet on her Windows laptop and shares her screen with MT Canvas. The team leader stands in front of the video wall and is able to update the spreadsheet directly from MT Canvas by using hand gestures.

Briefly, the Remote Touch setup procedure includes the following steps:

1. Specify the network interface and port numbers used by Remote Touch.
2. Install the Cornerstone software on the user’s laptop.
3. Confirm that the MT Canvas application computer and user’s computer are on the same network.
4. Share the user’s computer screen with MT Canvas.
5. Obtain the Remote Touch port number assigned to the user’s computer.
6. Configure the user’s computer to receive touch data from MT Canvas.
7. Pin the Shared Screen widget in MT Canvas.

These steps are described in the following sections.

Remote Touch example. A team member (1) shares the spreadsheet on her Windows laptop with MT Canvas (2). The team leader (3) uses hand gestures to update the spreadsheet while it is displayed on the canvas (4). MT Canvas, running on the application computer (5), applies the update to the spreadsheet running on the laptop (6).

Terminology: Instructions in the following sections refer to the user’s ‘laptop’ when describing the external computer that shares its screen on the canvas. Although this external computer is generally a laptop, screen sharing is supported from any compatible Windows device including tablets and desktop computers.
7.1 Specify the network interface and port number for remote touch

**Note:** If you installed MT Canvas from a preconfigured disk image (see section 2.3), the correct network interface and port are already configured in mt-canvas.ini. You can therefore skip this task.

Touch data is sent from MT Canvas to the screen-sharing computer over the network. You must therefore open a remote touch server for a specific network interface and port number. Note that you only need to perform this task once, on the MT Canvas application computer.

Follow these steps:

1. Access the desktop: see section 4.1.1.
2. Right-click the desktop and launch a terminal emulator.
3. Using your preferred editor, edit mt-canvas.ini; see section 4.2.
4. Specify the network interface and port:
   a. Create a [remote-touch] block.
   b. Specify the name or ID of the external network interface on the application computer.
      For an application computer in the Meeting Room solution, the default interface for an external network is *em1*; see section 2.3.1.
      **Note:** Run the `ifconfig` Linux command to identify the network interface IDs on the application computer
   c. Specify the initial port number for screen-sharing devices. The default port is 5010.
      The remote touch feature uses a different port for each screen-sharing computer. For each additional computer, MT Canvas automatically increments the port number by 1 and assigns that port to the additional computer.
      **Note:** An application computer in the standard Meeting Room solution has a capture card with two inputs, enabling two screen-sharing computers to connect to MT Canvas at the same time.

For example:

```ini
[remote-touch]
interface=em1
port=55200
```
7.2 Install Cornerstone software on the user’s computer

Each user who wants to share their screen with MT Canvus must install the following items on their Windows computer or laptop:

- The Windows Cornerstone runtime.
- The ‘MultiTouch Cell’ driver.

To enable support for native Windows multi-touch functionality, the Cornerstone runtime package includes the MultiTouch Cell driver, a native Windows multi-touch driver. This driver must be installed separately.

Instructions for installing these items are included in the Cell User Manual.

7.3 Confirm the network connection

Confirm that the MT Canvus application computer and the user’s computer are connected to the same network.

7.4 Share the user’s computer screen with MT Canvus

The user must now share their computer screen with MT Canvus. Instructions for using the screen share feature are in section 6.1.
7.5 Obtain the Remote Touch port number assigned to the user’s computer

To enable Remote Touch, MT Canvus assigns a unique port number on the application computer to each screen-sharing instance. You must now discover which port has been assigned to the user’s laptop. Follow these steps:

1. In MT Canvus, open the Screen Share menu and tap the shared screen.

2. In the Screen Share widget, tap the Remote Control Info button; see the screenshot in section 7.2.

   A message box appears, showing the IP address of the application computer and the port number assigned to this screen-sharing instance.

3. Make a note of the IP address and port number. You will need to enter these details in config.txt in section 7.6.1.

   In the example above, the address and port are 10.36.0.70:8092.
7.6 Configure the user’s computer to receive touch data from MT Canvas

Now configure the user’s computer to recognize touch data received from MT Canvas. First, you must edit config.txt. Then ensure that WindowsTouchProxy.exe is running.

7.6.1 Edit config.txt to specify the assigned port number

In order to recognize touch data received from MT Canvas, you must configure Cornerstone on the user’s laptop to identify the application computer and the port number assigned to the user’s screen-sharing instance.

Follow these steps:

1. Locate the config.txt configuration file.
   
   Config.txt is installed as part of the Cornerstone runtime; see section 7.2. The file location depends on the operating system:
   
   - **Windows:** The file is saved in the user’s profile directory. For example, if Cornerstone was installed by user Joe, then config.txt is saved here: C:\Users\Joe\AppData\Roaming\MultiTouch
   
   - **Linux:** The file is saved in the ~user/MultiTouch subdirectory. For example, if Cornerstone was installed by user Joe, then config.txt is saved here: /home/joe/MultiTouch
   
   - **OS X:** The file is saved in the user’s library directory. For example, if Cornerstone was installed by user Joe, then config.txt is saved in this folder: /Users/Joe/Library/MultiTouch
   
   For full details about config.txt, see the **Cell User Manual**.

2. Edit config.txt to include a NetBridge block that will connect to the application computer.
   
   For example, if the IP address of the application computer is 10.36.0.70 and the port assigned to this screen-sharing instance is 8092, add the following to config.txt:
   
   ```
   NetBridge {
   host = "10.36.0.70"
   port = "8092"
   }
   ```

7.6.2 Start the WindowsTouchProxy.exe program

On the user’s computer, start the WindowsTouchProxy.exe program. While WindowsTouchProxy.exe is running, any application on the computer that supports Windows Touch can use the touch data received from MT Canvas.

**Important:** You must start WindowsTouchProxy.exe after specifying the network interface and port (see section 7.1).

**Note:** WindowsTouchProxy.exe is included with the Cornerstone runtime. You may prefer to add WindowsTouchProxy.exe to the list of Startup programs. This ensures that it is always running when it is needed by an application that supports Windows Touch.
7.7 Pin the Shared Screen widget

In MT Canvus, pin the Shared Screen widget. This ensures that touch data is transmitted to the receiving application on the user’s computer.

Shared screen widget. 1 Widget is pinned to allow application to receive touch input. 2 Remote Control Info button.

Note: Pinning a widget enables MT Canvus to correctly interpret a user’s hand and finger gestures as inputs to the application running in the widget instead of as attempts to move or resize widget.
8 Enable video output

MT Canvus allows users to stream content from the canvas to an external monitor or projector, or to a virtual webcam. This feature is useful for reaching audiences who cannot see the screens. For example, a user may want to output screen content to a projector so that people sitting at the back of the conference hall, or in a different room, can see their presentation.

The video output feature must be set up in advance before it can be used in MT Canvus. This section describes how to set up video output. (Instructions for using the video output feature are included in the MT Canvus User Manual.)

Terminology: For simplicity, the instructions below refer to an ‘external monitor’ when describing the target device for video output. In practice, video output from MT Canvus can be streamed to any suitable device, including monitors, projectors, and virtual webcams.

8.1 Graphics card requirement: spare video output

The video output feature requires a spare video output on the graphics card in the MT Canvus application computer. The external monitor (or projector or virtual webcam) connects to the spare video output.

For example, the MultiTaction Meeting Room solution includes three Cells and an NVIDIA KT5200 graphics card. This is a quad head graphics card i.e., it has four video outputs. Three of the video outputs connect to the Cells; the fourth output is spare and can be used to stream video output to an external monitor.

![Video output example setup](image)

*Video output example setup. 1 Application computer. 2 NVIDIA K5200 graphics card. 3 I/O bracket. 4 DisplayPort video outputs. 5 DVI video outputs. 6 Three Cells in portrait mode. 7 External monitor, in landscape mode, connects to spare DVI video output.*
8.2 Update X11 with the external monitor layout

When enabling video output, you must first configure the X11 windowing system on the MT Canvas application computer. X11 needs to recognize both the Cells in the video wall and the external monitor. To do this, you must update the X configuration file, /etc/X11/xorg.conf, with details of the external monitor.

On application computers with an NVIDIA GPU, use the Display Configuration screen of the X Server Settings tool to specify the actual layout of the Cells (order and rotation) plus the size, rotation and logical position of the external monitor. Ensure the external monitor does not overlap the Cells. For usage instructions, please refer to your NVIDIA documentation.

NVIDIA X Server Settings dialog. This example shows the MultiTaction Meeting Room solution.

1 Display Configuration screen. 2 Three Cells in portrait mode. 3 External monitor. This example shows the external monitor in landscape mode.
8.3 Specify the display coordinates for video output

Now you need to update Cornerstone with display coordinates for the external monitor. To do this, you edit the screen.xml configuration file. Screen.xml maps the video output onto the external monitor’s physical screen area.

8.3.1 Configuration for a single external monitor

This section describes how to edit screen.xml to support a single external monitor. This section also assumes that a single graphics card is sufficient to drive the video wall Cells and the external monitor. (For example, a graphics card with four video outputs can drive three Cells and one external monitor.)

The examples below are based on the MultiTaction Meeting Room solution plus a single external monitor. The Meeting Room video wall comprises three 1080 x 1920 Cells in portrait mode with a 10 pixel vertical bezel between each Cell. The external monitor is in landscape mode.

Logical layout of Meeting Room solution plus single external monitor.  
1 Video wall comprising three Cells in portrait mode. 2 External monitor in landscape mode.

Follow these steps:

1. Locate screen.xml on the application computer.
   
   On Ubuntu computers, it is in the ~user/MultiTouch subdirectory. For example, if MT Canvas was installed by user Joe, then screen.xml is saved here:
   
   /home/joe/MultiTouch

2. Specify the total display area for MT Canvas excluding the external monitor.
   
   To do this, add a <layer-size> element in screen.xml. The <layer-size> value must match the total display area of the video wall.

   The Meeting Room solution requires the following <layer-size> element:

   ```xml
   <MultiHead type="">
   <layer-size type="">3260 1920</layer-size>
   ```

   Where:
   
   - The 3260 width is three portrait Cell widths plus two 10 pixel bezels ie, 1080 + 10 + 1080 + 10 +1080 pixels.
   - The 1920 height is one portrait Cell height ie, 1920 pixels.
3. Define a drawable region available for displaying the streamed video output.

To do this, you need a window element in screen.xml that incorporates the external monitor. The window location and size must match the total display area of the video wall plus the external monitor’s size, rotation and logical location as specified in xorg.conf in section 8.2.

For example, the Meeting Room solution with a single external monitor requires the following elements in screen.xml:

```xml
<!DOCTYPE mtdoc>
<MultiHead type="">
  <layer-size type="">3260 1920</layer-size>
  <GPU_1 type="window">
    <location type="">0 0</location>
    <size type="">5180 1920</size>
    <Area1 type="area">
      <location type="">0 0</location>
      <size type="">5180 1920</size>
      <graphicslocation type="">0 0</graphicslocation>
      <graphicssize type="">5180 1920</graphicssize>
    </Area1>
  </GPU_1>
</MultiHead>
```

Where:

- The window is named ‘GPU_1’ to reflect the fact that the MT Canvus application computer only has a single graphics card.
- The window size is 5180 x 1920 pixels, where the 5180 width is three portrait Cells with two 10 pixel bezels, plus a landscape external monitor ie 1080 + 10 + 1080 + 10 + 1080 + 1920 pixels.
- The area size is 5180 x 1920 pixels.
- The graphicssize size is 5180 x 1920 pixels.
- For each element, its location is the standard 0,0.

Note: A detailed explanation of screen coordinates in screen.xml is included in the Cell User Manual, available to download from the MultiTaction web site: https://cornerstone.multitouch.fi/multitaction-cells.
8.3.2 Configuration for two external monitors

This section describes how to edit `screen.xml` to support two external monitors. It also assumes that two quad-head GPUs are needed to drive the six video wall Cells and two external monitors.

The examples below are based on the MultiTaction Board Room solution plus two external monitors. The Board Room video wall comprises six 1920 x 1080 Cells in landscape mode with a 10 pixel vertical bezel between each Cell. The external monitors are in landscape mode. One GPU drives the three Cells and external monitor in the top row; a second GPU drives the three Cells and external monitor in the bottom row.

![Logical layout of Board Room solution plus two external monitors.](image)

1

Video wall comprising six Cells in landscape mode. 2

External monitors in landscape mode.

Follow these steps:

1. **Locate `screen.xml` on the application computer.**
   
   On Ubuntu computers, it is in the `~user/MultiTouch` subdirectory. For example, if MT Canvus was installed by user Joe, then `screen.xml` is saved here:
   
   `/home/joe/MultiTouch`

2. **Specify the total display area for MT Canvus excluding the external monitors.**
   
   To do this, add a `<layer-size>` element in `screen.xml`. The `<layer-size>` value must match the total display area of the video wall.

   The Meeting Room solution requires the following `<layer-size>` element:
   
   ```xml
   <MultiHead type="">
   <layer-size type="">5780 2170 </layer-size>
   ```

   Where:

   - The 5780 width is three landscape Cell widths plus two 10 pixel bezels i.e., `1920 + 10 + 1920 + 10 + 1920` pixels.
   - The 2170 height is two landscape Cell heights plus a 10 pixel bezel i.e., `1080 + 10 + 1080`.

3. **Define a drawable region available for displaying the streamed video output.**
   
   To do this, you need two `window` elements in `screen.xml` (one for each graphics card) that incorporate the external monitors. For each graphics card, the `window` location and size must match the total display area of its Cells plus the external monitor’s size, rotation and logical location as specified in `xorg.conf` in section 8.2.
The example setup of a Board Room video wall plus two external monitors requires the following elements in `screen.xml`:

```xml
<!DOCTYPE mtdoc>
<MultiHead type="">
  <layer-size type="">5780 2170</layer-size>

  <GPU_1 type="window">
    <location type="">0 0</location>
    <size type="">7700 1080</size>
    <Area1 type="area">
      <location type="">0 0</location>
      <size type="">7700 1080</size>
      <graphicslocation type="">0 0</graphicslocation>
      <graphicssize type="">7700 1080</graphicssize>
    </Area1>
  </GPU_1>

  <GPU_2 type="window">
    <location type="">0 1080</location>
    <size type="">7700 1080</size>
    <Area1 type="area">
      <location type="">0 1080</location>
      <size type="">7700 1080</size>
      <graphicslocation type="">0 1090</graphicslocation>
      <graphicssize type="">7700 1080</graphicssize>
    </Area1>
  </GPU_2>
</MultiHead>
```

Where:
- The `GPU_1` window element defines a drawable region for the first GPU, which drives the three Cells and external monitor in the top row of the video wall.
- The `GPU_2` window element defines a drawable region for the second GPU, which drives the three Cells and external monitor in the bottom row.
- In both cases, the window size is 7700 x 1080 pixels, where the 7700 width is three landscape Cells plus two 10 pixel bezels, plus a landscape external monitor ie, 1920 + 10 + 1920 + 10 + 1920 + 1920 pixels.
- The area size is 7700 x 1080 pixels.
- The graphics size is 7700 x 1080 pixels.
- For `GPU_1` elements, their location is the standard 0,0.
- For the `GPU_2` window and area elements, their location is 0,1080. For the graphicslocation element, its location is 0,1090 ie, 1080 + 10 pixel horizontal bezel.

**Note:** A detailed explanation of screen coordinates in `screen.xml` is included in the Cell User Manual, available to download from the MultiTaction web site: https://cornerstone.multitouch.fi/multitaction-cells.
8.4 Update MT Canvas with video output options

Now provide MT Canvas with details about the external monitor. You need to specify the external monitor’s name, location and size in the `mt-canvas.ini` configuration file. In particular:

1. Access the desktop: see section 4.1.1.
2. Right-click the desktop and launch a terminal emulator.
3. Using your preferred editor, edit `mt-canvas.ini`; see section 4.2.
4. Add an output block to `mt-canvas.ini`.
   
   If you want to use multiple video outputs, you must specify a separate Output block for each external monitor.
   
   Assign a unique name to each output blocks. These names are listed in the Output menu in MT Canvas. Choose names that help users to identify the target monitor, projector or virtual webcam. Example names include ‘Main Hall Projector’ and ‘Mezzanine Monitor’.

5. Now specify the logical location and size of the external monitor(s).
   
   Add location and size settings to each output block. These settings must match the `graphicslocation` and `graphicsize` elements in `screen.xml`.

8.4.1 Example video output specifications

To support the single external monitor specified in `screen.xml` in section 8.3.1, add the following lines to `mt-canvas.ini`:

```
[output: Main Hall Projector]
location=3260 0
size=1920 1080
```

To support the two external monitors specified in `screen.xml` in section 8.3.2, add the following lines to `mt-canvas.ini`:

```
[output: Main Hall Projector]
location=5780 0
size=1920 1080

[output: Mezzanine Monitor]
location=5780 1090
size=1920 1080
```
9 Set up support for MT Canvas emails

MT Canvas users can send personal items to their registered email address (that is, the email address associated with their personal codice card). This feature provides users with a simple method for exporting screen content out of MT Canvas.

Support for sending personal items as email attachments must be set up in advance before users can use it in MT Canvas.

9.1 Specify the SMTP settings and email properties

Provide MT Canvas with details about the SMTP server and account credentials that you want to use. You must also specify envelope details for emails sent by MT Canvas (the sender account, email subject and so on). You specify these details in the mt-canvus.ini configuration file.

1. Access the desktop: see section 4.1.1.
2. Right-click the desktop and launch a terminal emulator.
3. Using your preferred editor, edit mt-canvus.ini; see section 4.2.
4. Edit the smtp block in mt-canvus.ini. By default, fields in the smtp block are undefined. You must supply the following details:
   - **username**: Specify the email account that MT Canvas uses to access the SMTP relay server. For example, noreply@unipraxis.com.
   - **password**: Specify the password for the email account that MT Canvas uses to access the SMTP server.
   - **host**: Specify the name of the SMTP server that will forward emails from MT Canvas to your users. Alternatively, you can specify the SMTP relay service for routing emails through Google (smtp.gmail.com).
   - **port**: Specify the TCP port for mail submission on your SMTP server.
   - **ignore-proxy**: Specify whether to ignore your proxy server settings when routing emails sent from MT Canvas. This setting can be true or false. By default, it is set to false i.e., emails from MT Canvas are routed using the local proxy server settings.
5. Edit the mail block in mt-canvus.ini. By default, fields in the mail block are undefined. You must supply the following details:
   - **subject**: Specify the Subject line for emails sent by MT Canvas. This will typically be Content from MultiTaction Canvas.
   - **sender**: Specify the actual email account (the display name and address) that your organization will use to send the MT Canvas emails to users. Enclose the actual address in <angle brackets>. For example: MultiTaction Canvas <noreply@unipraxis.com>
from Specify the email account (the display name and address) that will appear in the From field in MT Canvus emails. This account will generally be the same as the sender account. For example:

MultiTaction Canvus <noreply@unipraxis.com>

reply-to Specify the recipient email account (the display name and address) to be used if a user replies to an MT Canvus email. In practice, this account will rarely be needed. For example:

MultiTaction Canvus <noreply@unipraxis.com>

9.2 Example mt-canvus.ini

In this example mt-canvus.ini file, the Unpraxis organization has set up support for MT Canvus emails as follows:

```ini
[smtp]
username=noreply@unipraxis.com
password=3dw315n3r
host=smtp.gmail.com
port=587
ignore-proxy=false

[mail]
subject=Content from MultiTaction Canvus
sender=MultiTaction Canvus <noreply@unipraxis.com>
from=MultiTaction Canvus <noreply@unipraxis.com>
reply-to=MultiTaction Canvus <noreply@unipraxis.com>
```
10 Set up a fixed workspace

Workspaces enable you to split a canvas into separate sections so that two or more users can work independently on the screen without interfering with each other’s work. Each workspace extends over a specific section of the screen and presents the user with an independent viewpoint onto the canvas.

Normally, users can add or remove workspaces while they are working on the video wall. But MT Canvas also supports fixed workspaces. These workspaces cannot be resized or removed and are defined in the mt-canvas.ini configuration file.

Why use fixed workspaces? Typically, you would define a fixed workspace on a standalone Cell in order to remotely manage the main video wall in real time. For example, a presenter defines a fixed workspace on a single Cell that is physically separate from the main video wall. If the single Cell and video wall are both displaying the same canvas, the presenter can remotely demonstrate content on the video wall.

10.1 Define a fixed workspace

1. If you intend to display the fixed workspace on a Cell that is separate from the main video wall, update X11 with the logical layout of the Cells. See section 8.2 for guidance.

2. Access the desktop: see section 4.1.1.

3. Right-click the desktop and launch a terminal emulator.

4. Using your preferred editor, edit mt-canvas.ini; see section 4.2.

5. Locate the system block in mt-canvas.ini.

6. Add a fixed-workspaces setting.

   This setting specifies the size of two workspaces and must reflect the logical Cell layout that you specified in step 1.

   The first workspace represents the main workspace on the video wall. The second workspace represents the fixed workspace on the standalone Cell.

   For example, to define a fixed workspace on a standalone Cell for controlling a Meeting Room video wall (three Cells in portrait mode), add the following entry:

   ```
   [system]
   fixed-workspaces=3260x1920,1920x1080
   ```

   Where the 3260 width is three Cell widths plus two bezels ie, 1080 + 10 + 1080 + 10 +1080 pixels.
11 Back up and restore MT Canvas data

This section describes how to back up and restore MT Canvas data.

11.1 Create a backup

All MT Canvas user data is stored under the application root folder. The default is /home/multi/.mt-canvus. To make a backup, simply back up all the files in this folder.

For example, to make a compressed archive of the folder, run these commands:
```bash
cd /home/multi
.tar zcvf mt-canvus-backup.tar.gz .mt-canvus
```

11.2 Restore a backup

To restore a backup, replace the application root folder with your backup files.

For example, the compressed backup archive described in section 11.1 can be restored with these commands:
```bash
cd /home/multi
tar zxvf mt-canvus-backup.tar.gz
```

11.3 Backups during upgrade

When you update MT Canvas to a newer version (see section 10), it automatically creates a backup before migrating the user data.

The backup is created in the same folder, and with the same name as, the MT Canvas data folder. Backup files have a .tar.gz extension, and with a numeric identifier if a backup file with the same name already exists. For example:
```
/home/multi/.mt-canvus.tar.gz
/home/multi/.mt-canvus1.tar.gz
/home/multi/.mt-canvus2.tar.gz
/home/multi/.mt-canvus3.tar.gz
```

The backup file retains the old version number and data structure so the data can be restored if you need to roll back to a previous MT Canvas version.
12 Update the MT Canvas version

12.1 Command line updates

From MT Canvas 1.0.1 onwards, you can use the `mt-canvus-setup` command line tool to perform updates. For information about software update commands, see section 3.

12.2 Manual updates

Alternatively, you can download manual installation .sh packages for specific versions of MT Canvas. You then need to convert these to executables to install the new version onto your Ubuntu application computer.

- Details about manual installations are in section 2.5.
- Details about MT Canvas versions are listed in Appendix A.
13 MT Canvus plugins

Reference documentation for extending MT Canvus functionality through plugins and custom code can be found here:

https://cornerstone.multitouch.fi/plugins
Appendix A. MT Canvus downloads

MultiTaction can provide preconfigured MT Canvus images. The disk images are intended for the standard Meeting Room solution package by MultiTaction, which comprises three MultiTaction MT555 Cells in portrait mode. Each disk image includes a preconfigured Ubuntu 14.04 LTS operating system running a pre-installed version of MT Canvus.

Alternatively, you can request disk images for specific releases. Separate images are available for application computers with AMD and NVIDIA graphics card. You can then manually install these images (see section 2.5). Previous MT Canvus releases are listed below.

**Note: If you require an MT Canvus image, contact MultiTaction Support:**
https://www.multitaction.com/support-services

**Version 1.2.2**

Released June 22, 2016

- Fixed missing text cursors
- Fixed on-screen keyboard issues
- Fixed potential crashes when removing USB drive
- Fixed remote touch initialization failure if network unavailable
- Fixed canvas list issue
- Fixed resize handle issue

**Version 1.2.1**

Released May 30, 2016

- Fixed potential crashes while running Experience
- Fixed browser pop-up issue while running Experience
- Fixed WebGL failure caused by error in Chromium GPU blacklist
- Fixed browser audio issue
- Fixed issue affecting annotation at workspace edges
- Fixed button issues for anchor presentations
- Fixed issue with file operations sometimes failing to progress
- Fixed various widget location issues
- Fixed issue with developer mode being enabled by default
- Changed startup script to ensure PulseAudio is running
- Changed the default number of video decoding threads from 1 to 2 per video
Version 1.2.0

Released April 21, 2016

- New features
  - Split workspaces
  - Duplicate widgets
  - Floating widgets
  - Snapshot area selector
  - Audio capture from video input
  - Support for downloading and uploading files with browser
  - Transparent mode for browser
  - Support for browser pop-ups, dialogs and error pages
  - Bottom canvas menus for large installations
  - Keyboard shortcuts
  - Functionality to move active remote control to a specific widget
  - Option to set eraser area in configuration file
  - Icons for tables in folders
  - Automatic uploading of crash dumps
  - Optional PulseAudio back-end for audio playback

- Enhancements
  - Improved support for physical keyboards
  - Improved names for items sent as email attachments
  - User interface changes to: remote control; video output menu; and video widget
  - User interface changes to keep items (folders, anchor list, and canvas list) on top of canvas content
  - Opening animation changes to finger menus and personal folders
  - Changes to table editing icons
  - Folder widgets show unsupported files with placeholder images
  - Changes to storing application logs in user home folder
  - Changes to the default eraser size

- Fixes
  - Fixed unpartitioned USB devices not displaying in MT Canvas
  - Fixed issue with importing widgets from personal folder to canvas
  - Fixed annotations not being saved correctly in edit history
  - Fixed opening migration loading screen when migration is not needed
  - Fixed handling of canvases and anchors of different aspect ratios
  - Fixed video outputs staying active when returning to Experience
  - Fixed crashes when:
    - rearranging anchors in anchor list
    - loading PDFs
    - grouping widgets with no parent
    - loading browser at startup
    - closing browsers
- closing video input widget with active remote control
- tables with empty drop events
- there is no valid canvas
- Fixed duplicate widget IDs when importing same canvas multiple times
- Fixed anchor list making the application slow
- Fixed remote control not working in widgets in table
- Fixed undo issues when deleting a browser
- Fixed missing pin-status of grouped widgets when loading a canvas
- Fixed automatic idle timeout of on-screen keyboard
- Fixed inconsistent text capitalization in titles and tooltips
- Fixed empty tooltip for anchor presentation
- Fixed error description for null name when creating folder or registering codice
- Fixed incorrect icon when closing annotation menu in presentation
- Fixed incorrect initial size for PDF widget scroll bar
- Fixed spawn location for widget snapshot
- Fixed incorrect ‘email sent’ message after registering a codice card
- Removed resize handle for pinned widgets
- Removed extra eraser codes from default config file

Version 1.1.4
Released December 8, 2015
- Fixed image search due to Google removing the search API. The API requires additional Configuration to work; see the image search page for details.
- Fixed secondary menu close button not closing sub-menus

Version 1.1.3
Released December 1, 2015
- Added option to change annotation parameters from plug-ins
- Fixed issue where pen tracking is disabled when Cells restart while Canvus running
- Fixed issue with migrated anchors
- Fixed annotation depth issues
- Fixed missing annotations in PDF snapshots and emailed images
- Fixed issue with cropped edges when copying notes to folder

Version 1.1.1
Released November 26, 2015
- Added video output functionality
- Added import & export of canvases
- Added video stream support
- Added remote touch functionality
- Added web bookmarks
- Added tables for restricting content layout
- Added option to log out after inactivity (disabled by default)
- Added example plugin to show custom content from an external source
- Fixed crash when interacting with canvas while it was loading
- Fixed performance issues with lots of annotations
- Fixed audio panning with default Experience configuration
- Fixed Codice registration dialog not disappearing after a timeout
- Fixed email progress indicator for empty messages
- Fixed various buttons not having visual push feedback
- Fixed various empty tooltips
- Fixed image search result window being scalable
- Fixed grouping sometimes resulting in very large widget menu icons
- Fixed canvas menu positioning under bezels on some display configurations
- Fixed moving content from its title bar
- Fixed anchor list not being closed when changing canvas
- Fixed image search not working with network proxy
- Fixed potential crash when converting multiple PDFs simultaneously

Version 1.0.2

Released September 21, 2015
- Added feature to reposition keyboard after pressing keyboard button in note widget
- Added JavaScript plug-in example
- Fixed slow performance when browsing folders with many files
- Fixed CEF browser crash in Experience when inputting text
- Fixed widget menu buttons that could be rotated
- Fixed very low resolution on canvas snapshots
- Fixed small hitbox for input bars and closing finger menu
- Fixed crash when creating a new folder
- Fixed keyboards not staying inside the visible area
- Added timeout for keyboards

Version 1.0.1

Released September 3, 2015
- Removed extra branding
- Fixed keyboard close button overlapping web search
- Fixed some missing dependencies from fresh installations
- Fixed crash when loading folders with several videos
- Fixed some keyboards moving with canvas
- Fixed deleted browsers appearing after canvas reload
- Fixed anchors being highlighted after loading canvas
- Fixed dropping items on anchor list
- Fixed canvas loading sometimes getting stuck
- Fixed erasing annotations not persisting after canvas reload

**Version 1.0.0**

Released July 3, 2015

- Added basic about window to show the version number
- Added plugin API
- Added drop shadows to few places in the UI
- Added tooltips for canvas menu
- Added icons for PDFs and web pages in folders
- Added Google branding to web search
- Added simple fake text selection to input fields
- Changed the name to MT Canvus
- Fixed videos not being shown in the info panel preview
- Fixed some layout problems with canvas menu
- Fixed image titles in image search results
- Fixed flickering issues in grouping feedback
- Fixed background tasks not being stopped when ejecting a USB
- Fixed PDF previews generating more pages than necessary
- Fixed a performance issue with the application font
- Fixed typo in Codice registration window
- Fixed network proxies not working with email or web search
- Fixed folder widget automatically renaming duplicate folders
- Fixed startup scripts not parsing additional command-line arguments
- Fixed missing feedback from close buttons
- Fixed progress indicators in the UI
- Fixed crash in welcome screen if the plugin is not found
- Fixed some tooltip popup behavior
- Fixed browser not using already open keyboard
- Fixed several issues in undo/redo history

**Note:** The names of the application binary, installation folders, default data folders, and command-line arguments have been changed. Check your startup scripts and possible Experience integration files after the update. This version is not backwards compatible with previous versions.