TotalView Remote Display

Using the TotalView Remote Display client, you can start and then view TotalView as it executes on another system, so that TotalView need not be installed on your local machine.

Remote Display Supported Platforms

Remote Display is currently bundled into all TotalView releases.

Supported platforms include:

- Linux x86 (32-bit) and Linux x86-64

- Microsoft Windows

- Apple macOS Intel

No license is needed to run the Client, but TotalView running on any supported operating system must be a licensed version of TotalView 8.6 or greater.

Remote Display Components

TotalView Remote Display has three components:

- The Client is a window running on a Remote Display supported platform (See Remote Display Supported Platforms on page 2).

- The Server is invisible, managing the movement of information between the Viewer, the remote host, and the Client. The Server can run on all systems that TotalView supports. For example, you can run the Client on a Windows system and set up a Viewer environment on an IBM RS/6000 machine.

- The Viewer is a window that appears on the Client system. All interactions between this window and the system running TotalView are handled by the Server.

Figure 1 shows how these components interact.

Figure 1, Remote Display Components
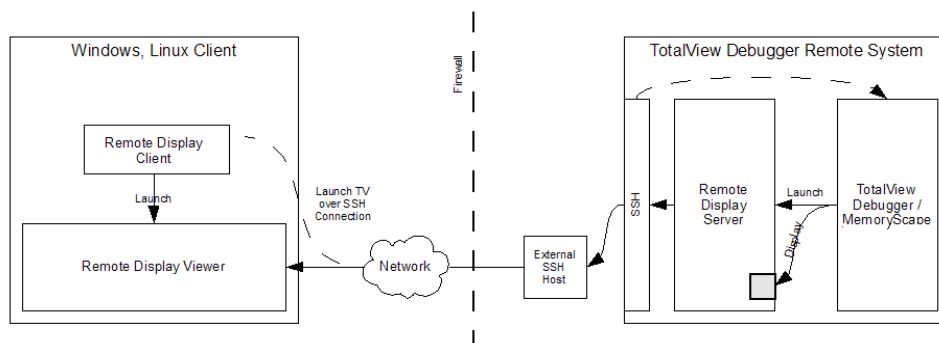
In this figure, the two large boxes represent the computer upon which you execute the Client and the remote system upon which TotalView runs. Notice where the Client, Viewer, and Server are located. The small box labeled External SSH Host is the gateway machine inside your network. The Client may be either inside our outside your firewall. This figure also shows that the Server is created by TotalView or MemoryScape as it is contained within these programs and is created after the Client sends a message to TotalView or MemoryScape.

TotalView and the X Window system must be installed on the remote server machine containing the rgb and font files in order for the remote display server to start correctly. The bastion nodes (if any) between the remote client machine and remote server machine do not require TotalView or X Window file access.

Installing the Client

The files used to install the client are in these locations:

- Remote Display Client files for each supported platform are in the **remote_display** subdirectory in your TotalView installation directory.

- Alternatively, request a Remote Display Client from TotalView's download page at https://totalview.io/downloads.

Because Remote Display is built into TotalView, you don't need a separate license for it. Remote Display works with your product's license. If you have received an evaluation license, you can use Remote Display on another system.

Installing on Linux

The Linux Client installers are either **RDC_installer_<*release_number*>-linux-x86-64.run** or **RDC_installer_<*release_number*>-linux-x86.run**.

Linux Requirements:

- The xterm application must be installed on both the RDC client and RDC server host.

- The RDC server host must have a window manager installed. The RDC looks for **icewm**, **fvwm**, **twm** and **mwm**. You can override the window manager in use by providing the executable name of your window manager on the RDC's Advanced Options dialog.

Installing on Microsoft Windows

The Windows Client installer is **RDC_Installer.<*release_number*>-win.exe**.

Windows Requirements:

- The xterm application must be installed on the RDC server host.

- The RDC server host must have a window manager installed. The RDC looks for **icewm**, **fvwm**, **twm** and **mwm**. You can override the window manager in use by providing the executable name of your window manager on the RDC's Advanced Options dialog.

Installing on macOS

The macOS installer is **RDC_installer_*<release_number>*-macos.dmg**.

macOS Requirements:

- The xterm application must be installed on both the RDC client and RDC server host.

- The RDC server host must have a window manager installed. The RDC looks for **icewm**, **fvwm**, **twm** and **mwm**. You can override the window manager in use by providing the executable name of your window manager on the RDC's Advanced Options dialog.

- Catalina (macOS 10.14) and newer users must install the free Real VNC viewer from https://www.realvnc.com/en/connect/download/viewer/macos/.

Client Session Basics

The TotalView Remote Display Client is simple to use. Just enter the required information, and the Client does the rest.

On Linux, invoke the Client with the following:

```
remote_display_client.sh
```

On Windows, either click the desktop icon or use the TVT Remote Display item in the start menu to launch the remote display dialog. On macOS, run the TVRemoteDisplayClient application from the Applications area.

Figure 2, Remote Display Client Window
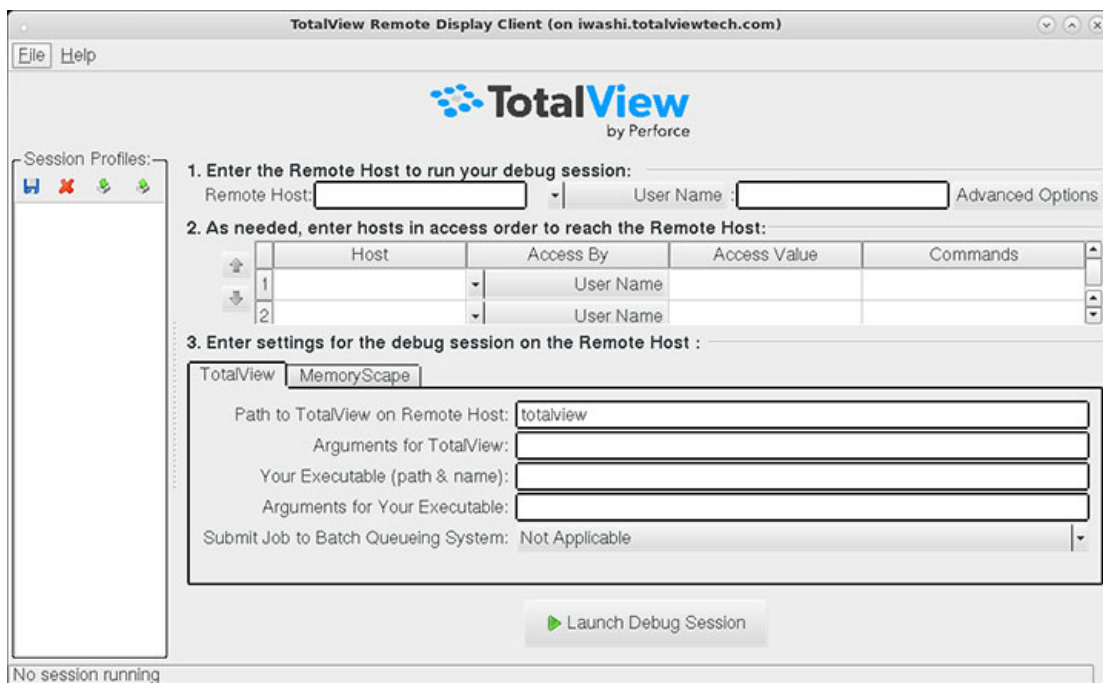
The Client window displays similarly on Linux, Windows, or macOS.

Here are the basic steps:

1. **Enter the Remote Host**

   - **Remote Host**: The name of the machine upon which TotalView will execute. While the Client can execute only on specified systems (see Remote Display Supported Platforms), the remote system can be any system upon which you are licensed to run TotalView.

- **User Name** dropdown: Your user name, a public key file, or other **ssh** options.

2. **(Optional) As needed, enter hosts in access order...**(depending on your network).

   If the Client system cannot directly access the remote host, specify the path. For more information, see Naming Intermediate Hosts on page 12.

3. **Enter settings for the debug session on the Remote Host**

   Settings required to start TotalView on the remote host. (The TotalView and MemoryScape tabs are identical.)

   - **Path to TotalView on the Remote Host**: The directory on the remote host in which TotalView resides, using either an absolute or relative path. "Relative" means relative to your home directory.

   - **(Optional) Your Executable**: Either a complete or relative pathname to the program being debugged. If you leave this empty, TotalView begins executing as if you had just typed **totalview** on the remote host.

   - **Other options**:

     You can add any command-line options for TotalView or your program.

     TotalView options are described in the "*TotalView Debugger Command Syntax*" chapter of the *LegacyTV Reference Guide*.

     For arguments to your program, enter them in the same way as you would using the **-a** command-line option.

Additional options include:

- **Advanced Options:** Press the Advanced Options button to customize client/server interaction and server execution, Advanced Options on page 10.

- **Submit job to batch queuing system:** You can submit jobs to the PBS Pro and LoadLeveler batch queuing systems, Submitting a Job to a Batch Queuing System on page 13.

Launching the Remote Session

Next, press the **Launch Debug Session** button, which launches a password dialog box.

Figure 3, Asking for Password
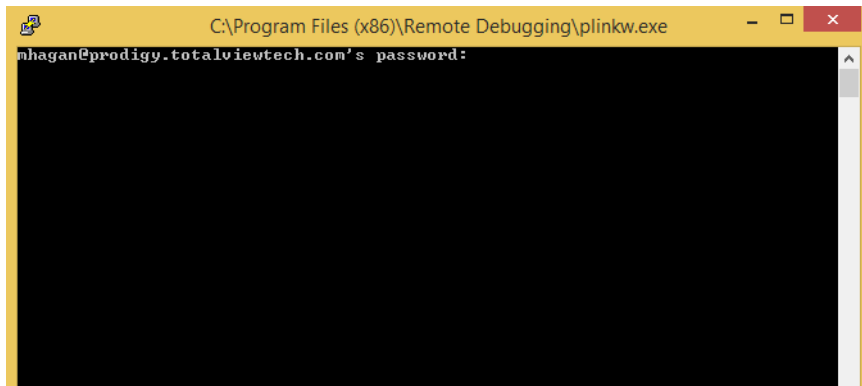
Depending on how you have connected, you may be prompted twice for your password: first when Remote Display is searching ports on a remote system and another when accessing the remote host. You can often simplify logging in by using a public key file.

After entering the remote host password, a window opens on the local Client system containing TotalView as well as an xterm running on the remote host where you can enter operating system and other commands. If you do not add an executable name, TotalView displays its **File > New Debugging Session** dialog box. If you do enter a name, TotalView displays its **Process > Startup Parameters** dialog box.
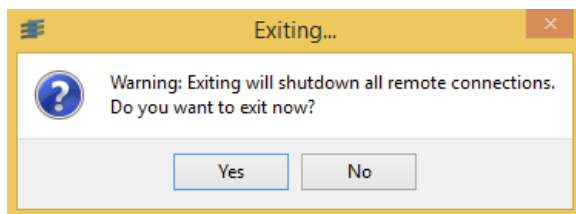
Closing the Remote Session

To close the session:

- From the Client, terminate the Viewer and Server by pressing the **End Debug Session** button. (The **Launch Debug Session** button changes to this button after you launch the session.)

- Click **Close** on the Viewer's window to remove the Viewer Window. This does not end the debugging session, so then select the Client's **End Debug Session** button. Using these two steps to end the session may be useful when many windows are running on your desktop, and the Viewer has obscured the Client.

Closing all Remote Sessions and the Client

To close all remote connections and shut down the Client window, select **File > Exit**.

Working on the Remote Host

After launching a remote session, the Client starts the Remote Display Server on the remote host where it creates a virtual window. The Server then sends the virtual window to the Viewer window running on your system. The Viewer is just another window running on the Client's system. You can interact with the Viewer window in the same way you interact with any window that runs directly on your system.

Behind the scenes, your interactions are sent to the Server, and the Server interacts with the virtual window running on the remote host. Changes made by this interaction are sent to the Viewer on your system. Performance depends on the load on the remote host and network latency.

If you are running the Client on a Windows system, these are the icons available:

Figure 4, Remote Display Client commands on Windows

From left to right, the commands associated with these icons are:

- Connection options

- Connection information

- Full Screen - this does not change the size of the Viewer window

- Request screen refresh

- Send Ctrl-Alt-Del

- Send Ctrl-Esc

- Send Ctrl key press and release

- Send Alt key press and release

- Disconnect

Advanced Options

The Advanced Options window in Figure 5 is used to customize Remote Display Client and Server interaction and to direct the Server and Remote Display Viewer execution.

Figure 5, Advanced Options Window

Options are:

- **Commands**: Enter commands to execute before TotalView begins. For example, you can set an environment variable or change a directory location.

- **Font Path:** Specify the remote host's font path, needed by the Remote Display Server. Remote Display checks the obvious places for the font path, but on some architectures, the paths are not obvious.

- **Color Location:** Specify the location of the **rgb.txt** file needed by the Remote Display Server. Remote Display checks the obvious places for the location, but on some architectures, its location is not obvious. Providing the correct location may improve the startup time.

- **VNC Viewer:** Select the VNC viewer to use for application display.

- **Remote Display Viewer Window Size:** The default size of the Remote Display Viewer is dynamically computed, taking into account the size of the device on which the Remote Display Client is running. You can override this by selecting a custom size, which will be saved with the profile.

- **Display Number:** Specify a display number for Remote Display to use when the Client and Server connect. The Remote Display Client determines a free display number when connecting to the Server, requiring two password entries in some instances. Specifying the display number overrides the Remote Display Client determining a free number, and collisions may occur.

- **ssh Port Number:** On most systems, **ssh** uses port 22 when connecting, but in rare instances another port is used. This field allows you to override the default.

- **Window Manager:** Specify the name of the window manager. The path of the window manager you provide must be named in your **PATH** environment variable. The Server looks for (in order) the following window managers on the remote host: **icewm, fvwm, twm,** and **mwm**. Specifying a window manager may improve the startup time.

The buttons at the bottom are:

- **Cancel:** Closes the window without saving changes.

- **Apply:** Saves the changes with the profile, leaving the window open.

- **OK:** Closes the window and saves the changes with the profile.

- **Reset:** Reverts back to the previously saved values.
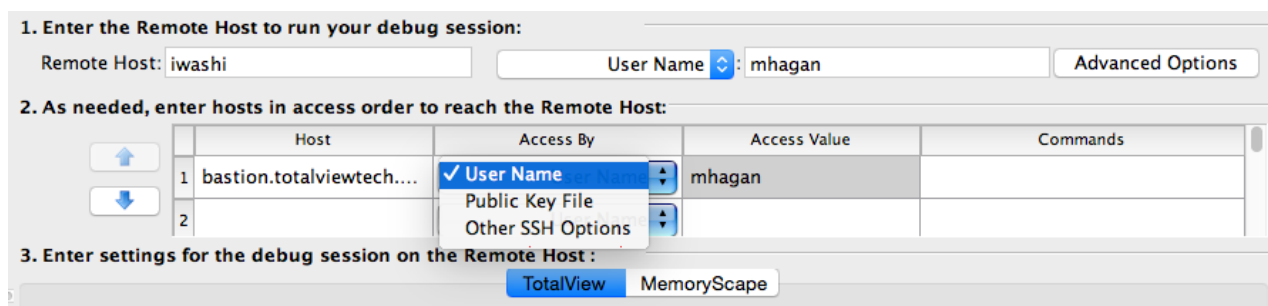
Naming Intermediate Hosts

If the Client system does not have direct access to the remote host, you must specify the path, or paths, along with how you will access the host. You can enter multiple hosts; the order in which you enter them determines the order Remote Display uses to reach your remote host. Use the arrow buttons on the left (⬆) to change the order.

Figure 6, Access By Options

- **Host:** The route the Client should take to access the remote host. For instance, this can be a network path or an IP address. If your network has a gateway machine, you would name it here in addition to other systems in the path to the remote host.

- **Access By/Access Value:** The most common access method is by a user name, the default. If this is incorrect for your environment, use the dropdown menu to select the correct method:

    - **User Name**, i.e. the name you enter into a shell command such as ssh to log in to the host machine. Enter this in the **Access Value** field.

    - **Public Key File**, the file that contains access information, entered into the **Access Value** field.

    - **Other SSH Options**, the ssh arguments needed to access the intermediate host. These are the same arguments you normally add to the ssh command.

- **Commands:** Commands (in a comma-separated list) to execute when connected to the remote host, before connecting to the next host.

Submitting a Job to a Batch Queuing System

TotalView Remote Display can submit jobs to the PBS Pro and LoadLeveler batch queuing systems.

Figure 7, Remote Display Window: Showing Batch Options
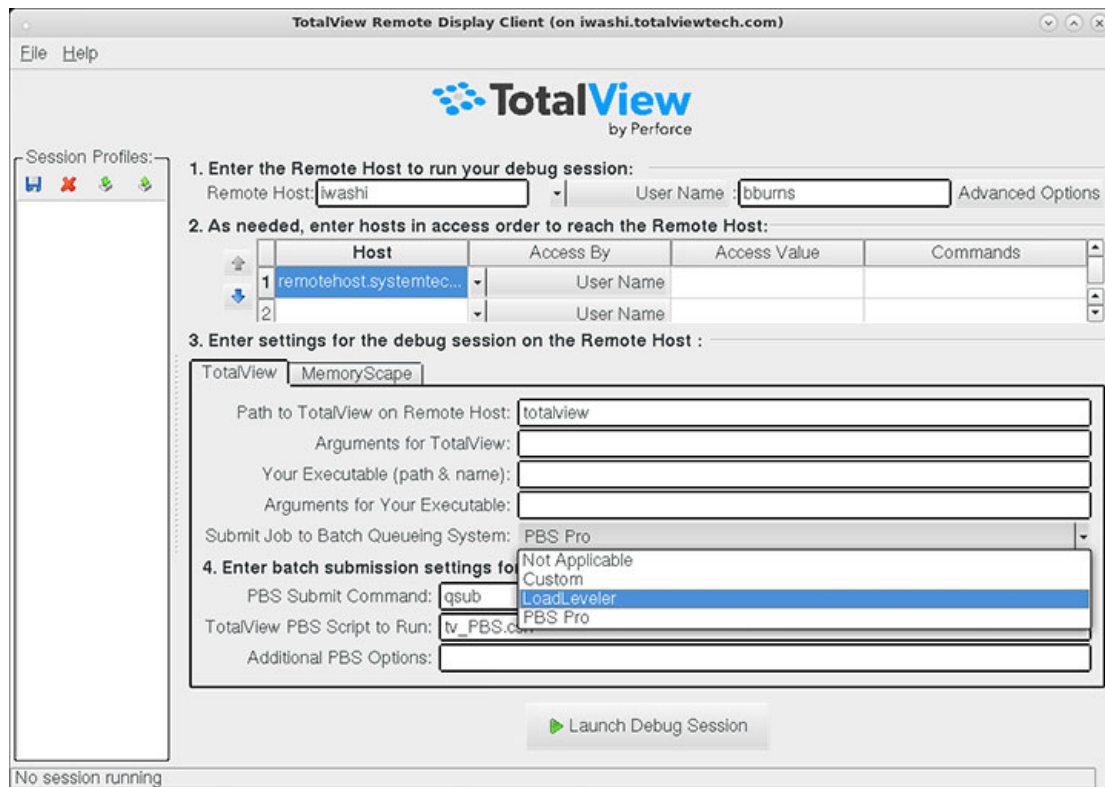
1. Select a batch system from the **Submit job to Batch Queuing System** dropdown list, either **PBS Pro** or **LoadLeveler**.

    The default values are **qsub** for PBS Pro and **llsubmit** for LoadLeveler.

    The **Script to Run** field is populated with the default scripts for either system: **tv_PBS.csh** for PBS Pro and **tv_LoadLeveler.csh** for LoadLeveler. These scripts were installed with TotalView, but can of course be changed if your system requires it. For more information, see Batch Scripts on page 18.

2. (*Optional*) Select additional PBS or LoadLeveler options in the **Additional Options** field.

    Any other required command-line options to either PBS or LoadLeveler. Options entered override those in the batch script.

3. Launch by pressing the **Launch Debug Session** button.

Behind the scenes, a job is submitted that will launch the Server and the Viewer when it reaches the head of the batch queue.

Setting Up Your Systems and Security

In order to maintain a secure environment, Remote Display uses SSH. The Remote Display Server, which runs on the remote host, allows only RFB (Remote Frame Buffer) connections from and to the remote host. No incoming access to the Server is allowed, and the Server can connect back to the Viewer only over an established SSH connection. In addition, only one Viewer connection is allowed to the Server.

As Remote Display connects to systems, a password is required. If you are allowed to use keyless ssh, you can simplify the connection process. Check with your system administrator to confirm that this kind of connection is allowed and the ssh documentation for how to generate and store key information.

**Requirements for the Client to connect to the remote host:**

- Install TotalView on any remote systems where TotalView will be run to debug programs.

- If you use an LM_LICENSE_FILE environment variable to identify where your license is located, ensure that this variable is read in on the remote host. This is performed automatically if the variable's definition is contained within one of the files read by the shell when Remote Display logs in.

- ssh must be available on all non-Windows systems being accessed.

- X Windows must be available on the remote system.

Session Profile Management

The Client saves your information into a profile based on the name entered in the remote host area. You can restore these settings by clicking on the profile's name in the Session Profiles area.

Figure 8 shows two saved profiles.
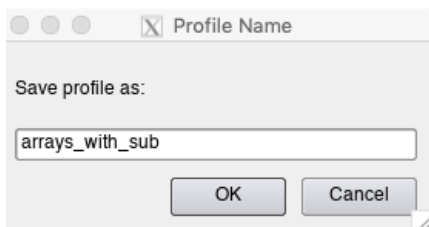
Figure 8, Session Profiles
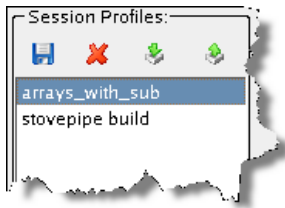
When you select a profile, the Client populates the right window with that profile's values.

If you edit the data in a text field, the Client automatically updates the profile information. If this is not what you want, click the **Create** icon to display a dialog box into which you can enter a new session profile name. The Client writes this existing data into a new profile instead of saving it to the original profile.

Saving a Profile

To save a profile, click the save button (💾) or select **File > Profile > Save**, then provide a profile name in the Profile Name popup.

This command saves the profile information currently displayed in the Client window to a name you provide, placing it in the **Session Profiles** area. You do not need to save changes to the current profile as the Client automatically saves them.

Deleting a Profile

To delete a profile, click the delete button (✖) or select **File > Profile > Delete**. This command deletes the currently selected profile and requires a confirmation.
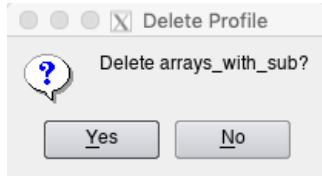
Sharing Profiles

To import a profile, click the import button (🔽) or select **File > Profile > Import**, and then browse to the profile to import. After you import a file, it remains in your Client profile until you delete it.

To export a profile, click the export button (🔽) or select **File > Profile > Export**, browse to a directory where you want to export it, and then name the profile.

Batch Scripts

The actions that occur when you select PBS Pro or LoadLeveler within the **Submit job to Batch Queueing System** are defined in two files: **tv_PBS.csh** and **tv_LoadLever.csh**. If the actions defined in these scripts are not correct for your environment, you can either change one of these scripts or add a new script, which is the recommended procedure.

Place the script you create into *installation_dir*/*totalview_version*/**batch**. For example, you could place a new script file called **Run_Large.csh** into the *installation_dir*/**toolworks/totalview.2020.0/batch** directory.

tv_PBS.csh Script

Here are the contents of the **tv_PBS.csh** script file:

```
#!/bin/csh -f
#
# Script to submit using PBS
#
# These are passed to batch scheduler::
#
# account to be charged
##PBS -A VEN012
#
# pass users environment to the job
##PBS -V
#
# name of the job
#PBS -N TotalView
#
# input and output are combined to standard
##PBS -o PBSPro_out.txt
##PBS -e PBSPro_err.txt
#
##PBS -l feature=xt3
#
#PBS -l walltime=1:00:00,nodes=2:ppn=1
#
#
# Do not remove the following:
TV_COMMAND
exit
#
# end of execution script
#
```

You can uncomment or change any line and add commands to this script. The only lines you cannot change are:

```
TV_COMMAND
exit
```

tv_LoadLeveler.csh Script

Here are the contents of the **tv_Loadleveler.csh** script file:

```
#! /bin/csh -f
# @ job_type = bluegene
#@ output = tv.out.$(jobid).$(stepid)
#@ error = tv.job.err.$(jobid).$(stepid)
#@ queue
TV_COMMAND
```

You can uncomment or change any line and add commands to this script. The only line you cannot change is:

```
TV_COMMAND
```