**Use X forwarding on a personal computer to securely run graphical applications**

**Overview**

The X Window System (also known as X11, or just X) is a software package and network protocol that lets you interact locally, using your personal computer's display, mouse, and keyboard, with the graphical user interface (GUI) of an application running on a remote networked computer.

Using X forwarding in an [SSH](https://kb.iu.edu/d/aelc) session on your personal computer allows you to securely run graphical applications (i.e., X clients).

**Requirements**

For X forwarding in SSH to work your personal computer must be running an X server program. The X server program manages the interaction between the remote application (i.e., the X client) and your computer's graphics hardware and input devices.

Most Linux distributions have the X server installed, but if your personal computer is running Windows or Mac OS X 10.8 and later, you will most likely need to install and run an X server application, for example:

* For Windows, download and install [Xming](https://sourceforge.net/projects/xming/" \o "). For X forwarding to work, you'll need to start Xming before connecting to the remote system with your SSH client (e.g., PuTTY).
* For Mac OS X 10.8 and later, download and install [XQuartz](https://www.xquartz.org/" \o "). For X forwarding to work, you'll need to start XQuartz before making an SSH connection to the remote system. Once XQuartz launches, you can use X forwarding with SSH from the Mac OS X Terminal or from the xterm application in XQuartz.

Additionally, your personal computer's SSH terminal application must have X11 forwarding enabled:

* In Linux, the SSH terminal supports X forwarding by default.
* In Mac OS X, you may need to edit your sshd\_config file (typically found at /etc/sshd\_config or/etc/ssh/sshd\_config) if you have trouble using X forwarding. If sshd\_config includes #X11Forwarding no(or just X11Forwarding no), uncomment out the line (i.e., remove the leading #), and change it toX11Forwarding yes.
* In PuTTY for Windows, you can enable X forwarding new or saved SSH sessions by selecting Enable X11 forwarding in the "PuTTY Configuration" window ( Connection  > SSH > X11).

Also, the remote computer's SSH application must be configured to accept X server connections.

**Use SSH with X forwarding**

**Linux or Mac OS X**

To use SSH with X forwarding from your Linux or Mac OS X personal computer to run an X client application installed on Big Red II, Carbonate, or Karst at IU:

1. Open the SSH terminal client.
2. On the command line, enter (replacing username with your IU username):
   * For Big Red II:

ssh -Y username@bigred2.uits.iu.edu

* + For Carbonate:

ssh -Y username@carbonate.uits.iu.edu

* + For Karst:

ssh -Y username@karst.uits.iu.edu

1. **Note:**
2. The -Y option turns on trusted X forwarding. You should use it only when connecting to secure systems, such as the IU research computers.
3. Log in with your IU [passphrase](https://kb.iu.edu/d/acpu).

To test if X forwarding is working, try running xclock; on the command line, enter:

xclock

If X forwarding is working, the xclock graphical clock will appear on your personal computer's desktop.

**PuTTY for Windows**

To use SSH with X forwarding in PuTTY for Windows:

1. Launch your X server application (e.g., Xming).
2. Make sure your connection settings for the remote system have Enable X11 forwarding selected; in the "PuTTY Configuration" window, see Connection  > SSH > X11.
3. Open an SSH session to the desired remote system:
   * bigred2.uits.iu.edu
   * carbonate.uits.iu.edu
   * karst.uits.iu.edu
4. Log in normally with your IU username and passphrase.

To test if X forwarding is working, try running xclock; on the command line, enter:

xclock

If X forwarding is working, the xclock graphical clock will appear on your personal computer's desktop.

# Additional Tips for Using X11 on Odyssey

1. The X11 display location may need to be modified depending on the system configuration. For a local Windows system connecting to a host Linux HPC via Putty, this can be changed by navigating to SSH>X11 enabling X11 forwarding (check box) and then specifying “localhost:0.0” in the X display location.
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