

SSH and X2Go into GFDL

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Note:

These instructions are for connecting to your own workstation if it is running RHEL7, and to the RHEL7 public servers (public3 & public4.) They also assume you wish to use KDE as your desktop environment, not GNOME.

Follow the RealVNC instructions instead if your own workstation is running RHEL6, or you wish to connect to the RHEL6 public servers (public1 (AKA "public") & public2.) The RealVNC instructions can be found under the link at the bottom of this page.

If you wish to use GNOME instead on RHEL7, or you prefer TigerVNC over X2Go, follow the TigerVNC instructions. They can be found under the link at the bottom of this page.

Also note that these instructions assume you have admin rights on your client system in order to install X2Go Client (on Macs, you technically admin rights to install XQuartz, not X2Go Client itself.) (On Windows, there is a workaround documented.)

QuickStart

For experienced SSH users, the steps are:

- If you have a CAC and are using Tectia SSH client, follow the instructions you received for it, and add port forwardings for:
 - 2905 -> <your workstation>:22
 - 2908 -> public3:22
 - 2909 -> public4:22
- If you only have an RSA token or have a Mac, use a standard SSH client (like PuTTY) to connect to First.Last@ssh.gfdl.noaa.gov. your passcode requires your "PIN" and RSA fob number. Add the port forwardings listed in the above sub-bullets.
- In X2Go Client, connect to:
 - Host: 127.0.0.1
 - Username: First.Last
 - SSH Port: 2905, 2908 or 2909 (for your workstation, public3, or public4 respectively)
 - Session Type: KDE
 - Authenticate with your GFDL (Active Directory) password.

SSH Configuration

Which SSH method to use?

There are two methods for connecting to the GFDL SSH bastions:

- Tectia, with a DoD CAC (Common Access Card)
 - You are supposed to use this method if you have a CAC, and your home/remote machine runs either Windows or Linux.
 - To download Tectia please submit a <u>Service Desk Tectia Client Request</u>. Make sure to fill out the request form completely so the staff can help you accurately.
 - As part of the Service Desk request, you will receive instructions. Follow those instructions, then proceed to the <u>Tectia (CAC) Instructions</u> in this document for additional setup.
- PuTTY (Windows) or command-line ssh (Linux/Mac OS X), with an RSA fob
 - Follow the <u>PuTTY (Windows w/ RSA) Instructions</u> or <u>OpenSSH (Linux or Mac w/ RSA)</u> Instructions in this document.

Tectia (CAC) Instructions

- 1. Follow the instructions for setting up Tectia that you were provided with as part of the Service Desk request.
 - Note that we will be expanding upon the tunnel instructions from that document in this document.
- 2. Add tunnels (port forwardings) for your workstation (if you have one), public3 & public4.
 - Go back to the session configuration's tunnels page that you defined as part of the instructions provided with the ServiceDesk request.
 - Windows: Launch "Tectia SSH Terminal" from your start menu, then select "Profiles" -> "Edit Profiles..."
 - Linux: Run: ssh-tectia-configuration
 - Then on either OS: Connection Profiles -> GFDL -> Tunneling -> Local Tunnels
 - If you have your own workstation, click "Add..." to add a tunnel for it on listen port 2905
 - Type: TCP
 - Listen port: 2905
 - Destination host: Name of your workstation (three letter initials/alias)
 - Destination port: 22
 - Check the box "Allow local connections only"
 - Click "Add..." to add a tunnel for public3 on listen port 2908:
 - Type: TCP
 - Listen port: 2908
 - Destination host: public3
 - Destination port: 22
 - Check the box "Allow local connections only"
 - Click "Add..." to add a tunnel for public4 on listen port 2909:
 - Type: TCP
 - Listen port: 2909
 - Destination host: public4
 - Destination port: 22
 - Check the box "Allow local connections only"
 - Click "OK" to exit the Tectia configuration & save your settings.
 - Once a connection has been established, continue to the <u>X2Go Instructions</u> section.
- 3. Reminders:
 - ssh-cac.gfdl.noaa.gov is only a bastion. It does not give you any tools to do work on it.
 - From ssh-cac.gfdl.noaa.gov you can ssh to an internal Linux workstation or public server. You can work within your Tectia window, but only from the command-line.

PuTTY (Windows w/ RSA) Instructions

- 1. Follow the instructions to configure PuTTY to connect to GFDL in the 1st place under: https://www.gfdl.noaa.gov/access/documentation/
- 2. Add tunnels (port forwardings) for your workstation (if you have one), public3 & public4.

 Session Logging Terminal Keyboard Bell Features Window Appearance Behaviour Translation Selection Colours Connection Data Proxy Telnet Rlogin SSH Serial 	Basic options for your PuTTY session			
	Specify the destination you want to Host Name (or IP address) ssh.gfdl.noaa.gov Connection type: Raw Telnet Riogin	connect to Port 22 SSH Serial		
	Load, save or delete a stored sessi Saved Sessions rsa-ssh Default Settings rsa-ssh	Load Save Delete		
	Close window on exit: ◎ Always ◎ Never ◎ Or	nly on clean exit		

Features	-	Option	s controlling SSH p	oort forwarding
 Window Appearance Behaviour Translation Selection Colours Connection Data Proxy Telnet Rlogin SSH Kex Host keys Cipher Auth TTY X11 Tunnels Bugs More burs 		Port forwarding Local ports a Remote port Forwarded ports	accept connection is do the same (SS s: kstation:22	s from other hosts H-2 only) Remove
	в	L2908 pub L2909 pub Add new forwar Source port Destination	lic3:22 lic4:22 ded port: 2909 public4:22	Add
		 Auto 	IPv4	 Dynamic IPv6

• Start *PuTTY*

• You can find *PuTTY* under "Start", "All Programs"

• **Click "rsa-ssh" under "Saved Sessions".** You created this in the PuTTY Instructions document.

• Click the "Load" button.

- Go to the Tunnels Category as shown below.
- Note that you may already have tunnels that

append ".gfdl.noaa.gov" to the machine name. These are equivalent to just specifying the machine name.

• If you have your own workstation, create a tunnel for it on L2905

- Source port: 2905
- Destination: <workstation>:22

"<workstation>" is your workstation's alias / three letter initials.

- Click "Add"
- Create a tunnel for public3 on L2908
 - Source port: 2908
 - Destination: public3:22
 - Click "Add"
- Create a tunnel for public4 on L2909
 - Source port: 2909
 - Destination: public4:22
 - Click "Add"

• The image to the left shows all 3 tunnels, assuming the workstation alias (your initials) is "workstation" (which it is not.)

Session Logging Terminal Keyboard Bell Features Window Appearance Behaviour Translation Selection Connection Proxy Telnet Rlogin SSH Serial	Basic options for your Pu	TTY session	
	Specify the destination you want to Host <u>N</u> ame (or IP address) ssh.gfdl.noaa.gov	connect to Port 22	
	Connection type: ◎ Ra <u>w</u> ◎ <u>T</u> elnet ◎ Rlogin	SSH	
	Load, save or delete a stored sessi Saved Sessions	ion	
	rsa-ssh		
	Default Settings rsa-ssh	Load Sa <u>v</u> e Delete	
	Close window on e <u>x</u> it: ◎ Always ◎ Never ◎ Or	nly on clean exit	

• Return to the "Sessions" category.

• Make sure the "rsa-ssh" "Saved Session" is selected.

• **Click the "Save" button on the right** to save your changes to the "rsa-ssh" session.

3. Reminders:

• In the future click on "rsa-ssh" in the "Saved Sessions" list to open the connection.

• ssh.gfdl.noaa.gov is only a bastion. It does not give you any tools to do work on it.

• From ssh.gfdl.noaa.gov you can ssh to an internal Linux workstation or public server. You can work within your PuTTY window, but only from the command-line.

OpenSSH (Linux or Mac w/ RSA) Instructions

1. Edit your OpenSSH config file

With any text editor, open up ~/.ssh/config . The config should like look the following: Host GFDL

HostName	ssh.gfdl.noaa.gov
User	First.Last
LocalForward	2905 <workstation>:22</workstation>
LocalForward	2908 public3:22
LocalForward	2909 public4:22
GatewayPorts	no

- If you already have existing configuration for the GFDL, with "Host" set to anything, and with HostName set to either "ssh.gfdl.noaa.gov" or "ssh-rsa.gfdl.noaa.gov", you can use it instead, but you need to add the lines listed below.
- Replace "First.Last" with your own username.
- For the line with "2905 <workstation>"
 - Replace "<workstation>" with your workstation alias (your initials) if you have your own workstation.
 - Remove this line altogether if you do not have your own workstation.
- Note: "GatewayPorts no" is a security precaution. It makes ssh listen only on localhost.

2. Connect with OpenSSH

- Run: ssh GFDL
 - After a warning banner, you will be prompted for a PASSCODE. Enter in your "PIN" and your PASSCODE from your RSA FOB.
 - Once connected, you should see a prompt like: [First.Last@ssh ~]\$
- From there, you can connect to your own workstation or public3/public4 with a command like:
 - ssh public3
 - Enter your GFDL (Active Directory) password.
- 3. Reminders:
 - ssh.gfdl.noaa.gov is only a bastion. It does not give you any tools to do work on it.
 - From ssh.gfdl.noaa.gov you can ssh to an internal Linux workstation or public server. You can work within your OpenSSH window, but only from the command-line.

X2Go Instructions

Install X2Go Client on your computer

Windows:

- Download and install from https://www.x2go.org/
- During installation, select to install all the fonts, not just the subset. This fixes compatibility with certain applications within your session.

🖺 x2goclient 4.1.0.0-2017.03.1	1		x2goclient 4.1.0.0-2017.03.1	1	
Choose Components Choose which features of x2g	godient 4.1.0.0-2017.03.11 you wa	ant to install.	Choose Components Choose which features of x2	godient 4.1.0.0-2017.03.11 you wa	ant to install.
Check the components you w install. Click Next to continue.	ant to install and uncheck the comp	ponents you don't want to	Check the components you w install. Click Next to continue	ant to install and uncheck the comp	onents you don't want to
Select the type of install:	Recommended -		Select the type of install:	Custom 👻	
Or, select the optional components you wish to install:	X2Go Client (required) X2Go Client (required) Forts Wrong PUTTY Key Utilities V Desktop Shortcut Debug Build	Description The regular build of X2Go Client and all its required dependencies	Or, select the optional components you wish to install:	X2Go Client (required) X2Go Client (required) Fors Correct V Fors Correct Orect Desktop Shortaut Debug Build	Description Fonts are required for certain legacy/proprietary apps to run properly.
Space required: 50.4MB	۰ <u>اا</u> ۲		Space required: 88.5MB	۰ III ا	
Nullsoft Install System v2.50.0-L	Inicode		Nullsoft Install System v2.50.0-L	Jnicode	
	< <u>B</u> ack	Next > Cancel		< <u>B</u> ack	Next > Cancel

• Note that the above process requires admin rights. There is a workaround for not having admin rights documented here: <u>https://wiki.x2go.org/doku.php/doc:installation:x2goclient#detailed</u>

Mac:

- Install XQuartz 1st from https://www.xquartz.org
- Log out of your Mac and log back in after installing XQuartz.
 - If you merely updated it, this is not necessary.
- Download and install X2Go Client from https://www.x2go.org

Linux:

- Note that version 4.1.1.0 is necessary to fix a bug that affects sessions on Gaea. Any version since 4.0.0.0 should work for connecting to GFDL, but newer is recommended.
- Debian or Ubuntu: sudo apt-get install x2goclient
- Fedora: sudo dnf install x2goclient
- RHEL, CentOS, or other RHEL derivatives:
 - Enable EPEL according to instructions here: <u>https://fedoraproject.org/wiki/EPEL</u>
 - Note: It is likely already enabled.
 - sudo yum install x2goclient
- OpenSUSE and SUSE Linux Enterprise:
 - Add the repository from the OBS (OpenSUSE Build Service): <u>https://build.opensuse.org/project/show/X11:RemoteDesktop:x2go</u>
 - sudo zypper install x2goclient
- Most other distros: Install the package named "x2goclient"

Configure X2Go Client's Global Options

The options here aren't required, but are recommended for the best user experience.

- Launch the application X2Go Client
- The "Session preferences New Session" window will open up by default normally. Click Cancel.
- Go to Options -> Settings



- The General tab will open up by default.
- Enable "Display icon in system tray"
 Enable "Hide to system tray after connection is established."

• Enable "Restore from system tray after session is disconnected."

 $\circ~$ Hit OK. The 'Session Preferences - New Session" window will open up.

Define session for your workstation

- If you do not have your own workstation, skip to the section <u>Define session for public3</u>.
- Launch the application X2Go Client application if you haven't already.
 - $\circ~$ The "Session preferences New Session" window will open up. If it does not, click on the menu Session \rightarrow New Session.

Session preferences - GFDL - workstation	• Session Name: GFDL - workstation
	Replace "workstation" with your
Session Connection Input/Output Media Shared folders	workstation alias (your initials)
Session name: GFDL - workstation	• Host: 127.0.0.1
<< change icon	 Login: Your username in FIrst.Last format SSH port: 2905
Path: [/	• Session type: You must leave this as
Server	Click on the "Connection" tab
Host: 127.0.0.1	
Login: First.Last	
SSH port: 2905	
Use RSA/DSA key for ssh connection:	
Try auto login (via SSH Agent or default SSH key)	
Kerberos 5 (GSSAPI) authentication	
Delegation of GSSAPI credentials to the server	
Use Proxy server for 55H connection	
Session type	
KDE Command:	
OK Cancel Defaults	æ

	• Leave the "Connection speed" slider at
Session preferences - GFDL - Workstation	the default value of "ADSL" if any of
Session Connection Input/Output Media Shared folders	these criteria are met:
	○ You are not in the continental US
	• You are on cellular internet
MODEM ISDN ADSL WAN LAN	• You know that your internet connection
Compression	• You know that your internet connectio
Method: 16m-jpeg	bandwidth is less than 10mbit/sec
Image quality: 9	• You know that your latency is higher
	than 100ms
	Change the "Connection speed" slider to
	"WAN" (as seen in the nicture) if any of
	these criterie are met:
	\circ You are at a university in the United
	States.
	• You are on a home Comcast (Xfinity)
	Verizon FIOS internet connection within
	the general area around the GEDI
	\sim You are anywhere in the continental L
	o rou are anywhere in the continental c
	and you know that your internet
OK Cancel Defaults	connection is decently fast.
	Click on the "Input/Output" tab.
ession preferences - GFDL - Workstation	It is generally recommended to leave the
ession Connection Input/Output Media Shared folders	default custom resolution size (800x600
Display	and resize your session after you
🔘 Fullscreen	connect or maximize your session after
O Custom Width: 800 ★ Height: 600 ★	
🔘 Maximum available	you connect.
V Set display DPI 96	 "Fullscreen" is known to work well on
	Linux, but can cause the session to not
Xinerama extension (support for two or more physical displays)	display at all on Windows.
<u>Clipboard mode</u>	• "Set display DPI." Raise this from the
Bidirectional copy and paste	default value (06) if you find that fonts
Copy and paste from client to server	
Copy and paste from server to client	and/or icons are too small on a
Disable clipboard completely	high-resolution display. Good values to
Keyboard	try include:
Auto-detect keyboard settings	 128 (1080p laptop display)
O not configure keyboard	~ 160 (4K external monitor)
Configure keyboard	
	o 192 (4K laptop display)
	● Hit "OK".

Define session for public3

- Launch the application X2Go Client application if you haven't already.
 - The "Session preferences New Session" window will open automatically up if you have not already defined your own workstation (or any other session for that matter.) If it does not, click on the menu Session \rightarrow New Session.

		0033
Session pref	erences - GFDL - public3	 Host:
Session	Connection Input/Output Media Shared folders	 Login
Session name	: GFDL - public3	forma
1		• SSH
1		 Sess
22		KDF
		Cons
Path: /		of this
Control		
Derver	177001	work
hosini	127.0.0.1	"Con
SSH port	lone	OK w
Kerberi	o login (via SSH Agent or default SSH Key)	
Delega	ion of GSSAPI credentials to the server	
📃 Use Pro	xy server for SSH connection	
Session typ	e	
KDE	Command:	
2.4		
	OK Cancel Defaults	

- Session Name: GFDL public3
- 27.0.0.1
- Your username in Flrst.Last
- ort: 2908
- n type: You must leave this as
- the instructions from the section document Define session for your ation on what to set in the ction" and "Input/Output" tabs. Hit en you are done.

Define session for public4

• You should already have X2Go Client open and be at the main window based on the instructions from the last section. Click on the menu Session → New Session.

	Connection Input/Output	Media	Shared folder	5	
Session nam	e: GFDL - public4				
	<< change icon				
Path: /					
Server					
Host:	127.0.0.1				
Login:	First.Last				
SSH port:	2909				×
Use RSA/I	SA key for ssh connection:				
📃 Try au	o login (via SSH Agent or defa	ult SSH key)			
🔲 Kerbei	os 5 (GSSAPI) authentication				
🗌 Delega	tion of GSSAPI credentials to t	he server			
📃 Use Pr	oxy server for SSH connection				
Session ty)e				
KDE] Command			

- Session Name: GFDL public4
- Host: 127.0.0.1
- Login: Your username in FIrst.Last format
- SSH port: 2909
- Session type: You must leave this as KDE
- Consult the instructions from the section of this document <u>Define session for your</u> <u>workstation</u> on what to set in the "Connection" and "Input/Output" tabs. Hit OK when you are done.

Starting or connecting to an X2Go Session

- Note that unlike with VNC, there is no need to run a command on your workstation over the SSH connection to start an X2Go session. X2Go client has that functionality built in.
- You do however need Tectia, PuTTY, or OpenSSH to connect to the SSH bastion in the first place, and it must remain running during your entire X2Go session.



NOAA/GFDL X2Go Documentation. Find the latest version at http://www.gfdl.noaa.gov/access/documentation



 The 1st time you connect, within a few seconds, you should see a prompt to trust the host key. Hit Yes.

- Then wait upwards of 15 seconds.
- X2Go Client may state that there is a "SUSPENDED" KDE session and offer you the option to "Resume" it. "SUSPENDED" is what users would normally call "disconnected." There is nothing wrong with this session, you generally want to resume it.
- The X2Go Client window should disappear and become a taskbar icon (if you set the option in <u>Configure</u> <u>X2Go Client's Global Options</u>) and your X2Go session window (all at 1st black) should appear..

CFDL - public4		
<pre> GFDL - public4 ********************************</pre>	C (() () () () () () () () ()	
* of file computer system by any person, whether authorized or * unauthorized, constitutes consent to these terms. ************************************	** ** K	
redhat.		

• After waiting a few seconds, you will see the warning banner, to which you must hit OK.

• Your KDE desktop session will then start. You will see a screen like the following. If it is the 1st time you are logging into KDE at the GFDL, or on RHEL7 specifically, this screen may be present for a few minutes.

NOAA/GFDL X2Go Documentation. Find the latest version at http://www.gfdl.noaa.gov/access/documentation



 If you are connecting from a Windows client, you may not see your taskbar at the bottom of the session. To remedy this, resize the session window. Afterwards, you can resize it the same exact size as before if you'd like.

 This screenshot shows a successfully started session from a Windows client (after applying the resize fix.)

X2Go usage Reminders:

The Session can be resized after connecting by resizing the window.
To disconnect from your session and resume it later, click the X in the top-right window. Your session will continue to run for 1 week.

• Note: To end your session, you should select to logout within it.

What to do if X2Go doesn't work:

Verify your workstation is running RHEL7:

On your workstation, run: cat /etc/redhat-release

If the version is 6.x, you must use RealVNC instead. Directions can be followed here.

If you are not running RHEL7, when you attempt to connect, X2Go client will throw the error message: *x2golistsessions: command not found*

Verify the tunnels exist (Windows):

- Make sure the PuTTY or Tectia session is running and connected to either the SSH bastion, or your workstation / public server after that.
- Launch "Command Prompt" via: Start Menu -> All Programs -> Accessories -> Command Prompt
- Run:netstat -an | findstr 127.0.0.1:290.
 - The period at the end is part of the command.



- The row with "127.0.0.1:2905" should exist if you have your own workstation. The other 2 rows should always exist.
- Any additional lines are OK.

Verify the tunnels exist (Linux):

- Make sure the ssh terminal window or Tectia session is running and connected to either the SSH bastion, or your workstation / public server after that.
- Open up a terminal window and run: netstat -lntp | grep 127.0.0.1:290.
 - The period at the end is part of the command.
- The output should look like:

(Not all processes could be identified, non-owned process info

will not be shown, you would have to be root to see it all.)

	The 1	at O lines of output may on	may not aviat		
tcp	0	0 127.0.0.1:2909	0.0.0:*	LISTEN	15087/ssh
tcp	0	0 127.0.0.1:2908	0.0.0:*	LISTEN	15087/ssh
tcp	0	0 127.0.0.1:2905	0.0.0:*	LISTEN	15087/ssh
				/	

• The 1st 2 lines of output may or may not exist.

- The row with "127.0.0.1:2905" should exist if you have your own workstation. The other 2 rows should always exist.
- The number at the end (15087 in this example, but it is random) should exist. If it doesn't, it means that some other user account is using that port.
- The "ssh" at the end will be different if Tectia (or a different ssh client altogether) is in use.

Frequently Asked Questions

Why I am I creating 2 or 3 tunnels when I only use 1 machine at a time?

You are creating them as a precaution, in case of downtime with your workstation or any 1 public server.

What machines may I connect to with TigerVNC? What tunnels (port forwardings) should exist?

It is a good idea to create all of the X2Go tunnels listed below. This ensures that you can connect to more than just 1 machine in case of downtime.

Any additional tunnels you may have been instructed to add can coexist safely. 2 tunnels cannot share the same Local Port (AKA "Source Port") though.

The entire set of tunnels that the GFDL normally instructions you to create are as follows. (Only the ones in **bold are** needed for X2Go though.)

Target	Local Port	Remote Port	Application
Workstation alias	2905	22	SSH/SFTP (RHEL6 & RHEL7) and X2Go (RHEL7)
public1	2906	22	SSH/SFTP
public2	2907	22	SSH/SFTP
public3	2908	22	SSH/SFTP and X2Go
public4	2909	22	SSH/SFTP and X2Go
mayflower	3128	3128	Web Proxy
Workstation alias	5905	VNC Port #	TigerVNC (RHEL7) or RealVNC (RHEL6)
public1	5906	VNC Port #	RealVNC
public2	5907	VNC Port #	RealVNC
public3	5908	VNC Port #	TigerVNC
public4	5909	VNC Port #	TigerVNC

NOAA/GFDL X2Go Documentation. Find the latest version at http://www.gfdl.noaa.gov/access/documentation

How do I terminate an X2Go session from the command line?

- SSH into the workstation or public server
- Run the command: x2golistsessions
- This will produce output like: 49540|Michael.DePaulo-50-1509490455_stDKDE_dp16|50|lrdpub04-p.gfdl.noaa .gov|S|2017-10-31T18:54:15|46756ca4d44fca296da56245b084ad57|ip-addressredacted|57097|57098|2017-10-31T18:59:50|Michael.DePaulo|1018|57099|
- Run: x2goterminate-session <session>
 - Where "<session>" is the the group of characters after the 1st | but before the 2nd |
 - For example: x2goterminate-session Michael.DePaulo-50-1509490455_stDKDE_dp16

Are there any shortcut keys I should know about?

This is a brief list of shortcut keys that might be useful.

- Ctrl + Alt + T: disconnect
- Ctrl + Alt + F: toggle fullscreen/windowed (Do not press this on Windows clients. It will crash the X2Go Client child process VcXsrv that provides the session window.)
- Ctrl + Alt + M: minimize or maximize full screen window
- Ctrl + Alt + arrow keys: move viewport (when remote screen is bigger than client window) (Note: On Windows, this will rotate your windows desktop instead.)

Note: On Mac, use <COMMAND> instead of <ALT>