Accessing the Integrated Robot Control Software

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This document describes how to gain direct access to the integrated robot control software TinyCtrl that runs on the computer embedded in the robot. Direct access may be required for maintenance or update purposes. More specifically this document describes how to

- **Modify parameters** of the integrated robot control via SFTP (section 1 and 2)
- **Start the TinyCtrl executable via command line** to observe log messages directly during operation.

The Windows software CPRog/iRC and the Linux equivalent TinyCtrl make use of config files. If a config file of CPRog/iRC or TinyCtrl is changed the same changes need to be made on the other system. Otherwise unexpected behavior or collisions may occur.

1. SFTP-Access Via FileZilla

SFTP is the SSH file transfer protocol. Via SFTP data can be transferred between the Linux embedded computer and the Windows PC. FileZilla is a free SFTP-program.

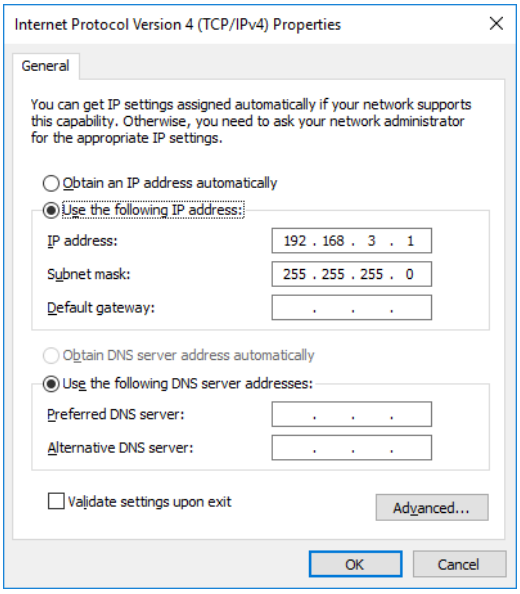
1. Download and install the FileZilla Client https://filezilla-project.org

2. Connect to the robot:

   Connect an Ethernet cable between PC and Linux Board.
   If your robot got 2 Ethernet ports use use the port next to the USB port.

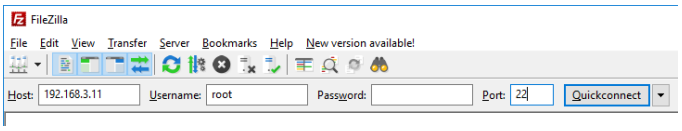
   PC-Configuration: The IPv4 address of the network adapter has to be configured to an address in the range 192.168.3.0-255. Do not use 192.168.3.11. That address is already taken by the linux board. Subnet mask is 255.255.255.0

   Use IP-address 192.168.3.1, for example.



3. Start FileZilla and enter the following connection details.:
   - Host: 192.168.3.11
   - Username and password:
     - User and password „robot“
     - User „root“, no password
   - Port: 22

   Click Quickconnect

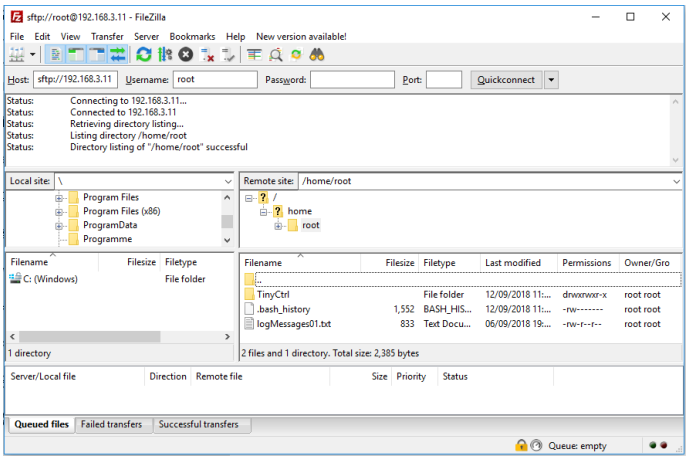


4. An SFTP connection to the embedded computer should now be established.

   - The left side of FileZilla shows the local directory structure of the PC.
   - The right side shows the directory structure of the embedded computer.

   - The embedded equivalent to the CPRog/iRC software is called TinyCtrl. It is located on the in the directory /home/robot/TinyCtrl or /home/root/TinyCtrl.

   - The directory structure inside the TinyCtrl folder resembles the directory structure of CPRog/iRC.

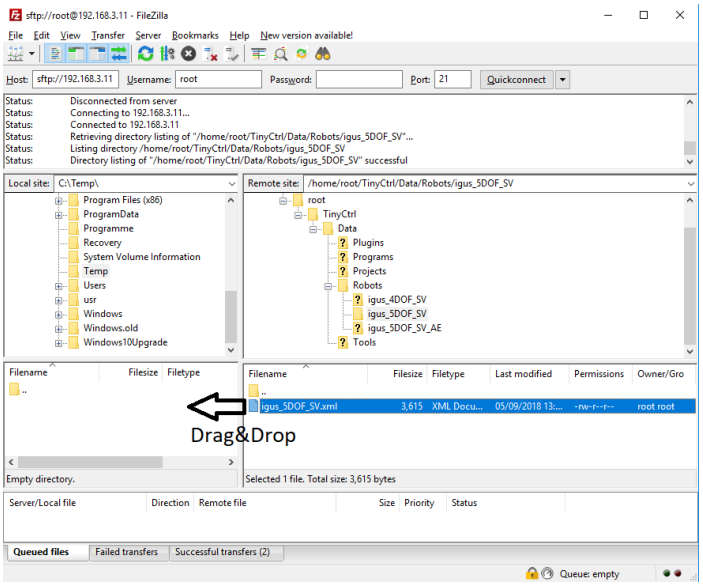


Please note that some files may be protected and need admin (“root”) permissions. These files can only be edited manually via SSH and a command line text editor or uploading files to the /home/robot/ directory and moving them via SSH. See section 5 on how to connect via SSH.

Important: Change these files only if you know what you are doing, these changes can damage the operating system and may require a factory reset or replacement of the embedded computer. If you know someone with Linux skills ask them for help.

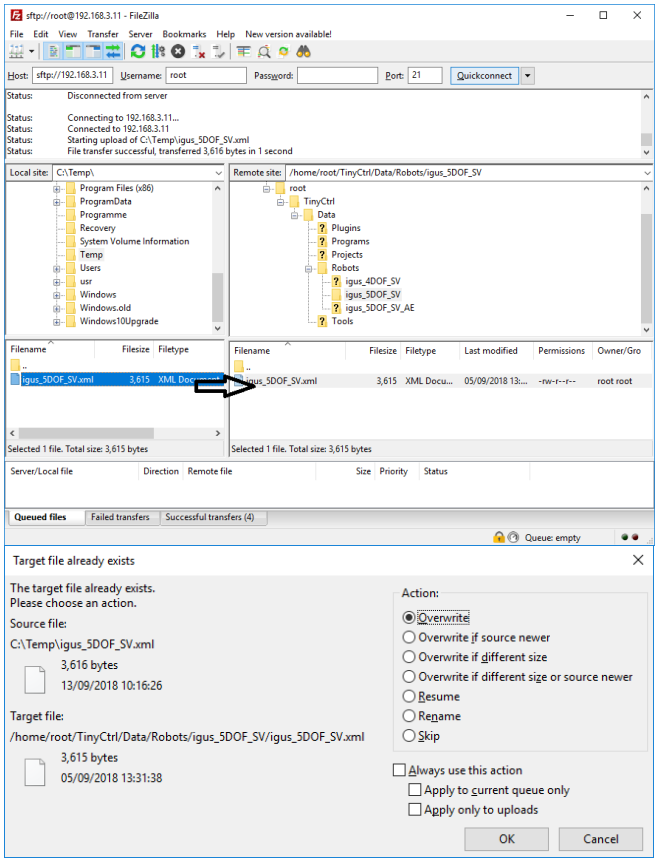
2. Modify parameters via SFTP

1. To edit a file, e.g. the robot configuration file, navigate into the folder that contains that file. Then drag and drop the file from the left window into the desired folder in right window (from the embedded computer to the local Windows PC).



2. The file can now be edited using a standard text editor, such as the Windows Notepad (Notepad++ is a significantly better editor https://notepad-plus-plus.org/).

3. Once all changes to the local file have been saved, it can be copied via drag and drop into the destination folder on the embedded computer.



You should be presented with a dialog box, if a file with the same name exists. Choose “Overwrite” to overwrite the file on the embedded computer and click ok.

If the file can not be written read the note in section 1.

4. To activate the changes, restart the robot.

3. Terminal Access via PuTTY

You can access the command line of the embedded control computer via an SSH client like PuTTY. This can be used to watch log messages for debugging or to change configuration files.

Linux skills are needed.

Only enter commands or do changes if you know what they are doing. Mistakes in configuration files can cause the robot control software to stop working correctly or the entire system may refuse to start. The latter case requires a factory reset or replacement of the embedded control computer.

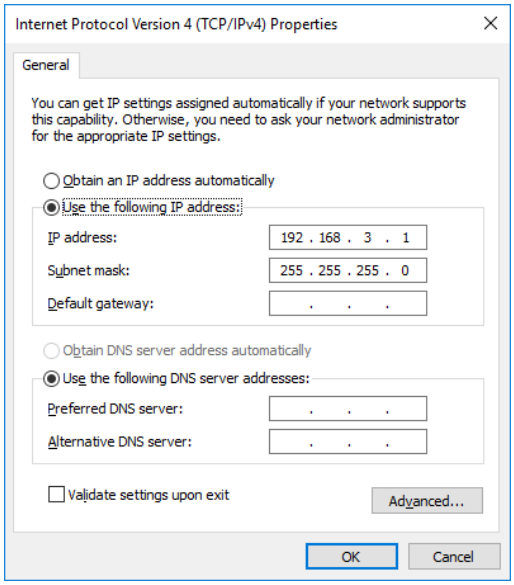
1. First download Putty.exe https://putty.org/

2. Connect to the robot via Ethernet:

   Connect an Ethernet cable between PC and Linux Board.
   If your robot got 2 Ethernet ports use use the port next to the USB port.

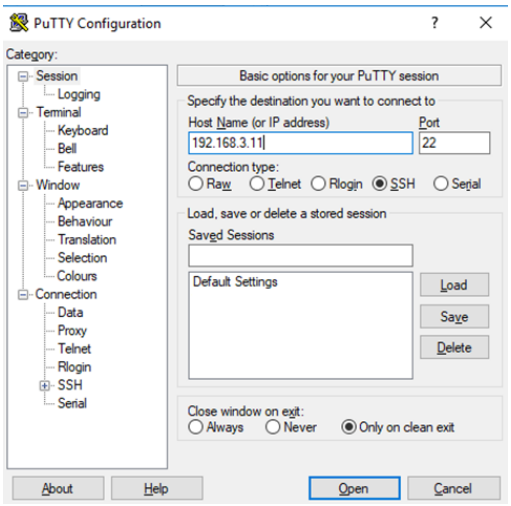
   PC-Configuration: The IPv4 of the network adapter has to be configurred to an address in the range 192.168.3.0-255. Do not use 192.168.3.11. That address is already taken by the linux board. Subnet mask is 255.255.255.0

   Use IP-address 192.168.3.1, for example.

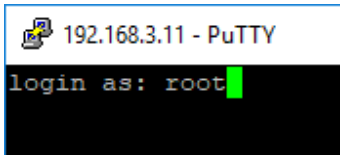


3. Start Putty.exe and enter the following address:
   - IP address: 192.168.3.11
   - Port: 22
   - Connection Type: SSH

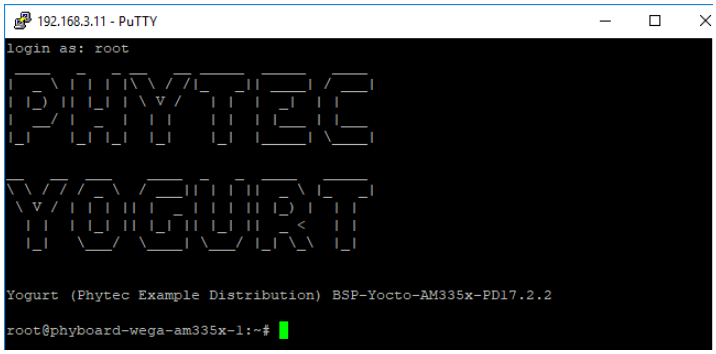
   Click "Open" .



4. A window appears. Type the user name “robot” and hit enter. Then enter the password “robot”. If this does not work close the window and open a new connection, then type the user name “root”. No password should be required.



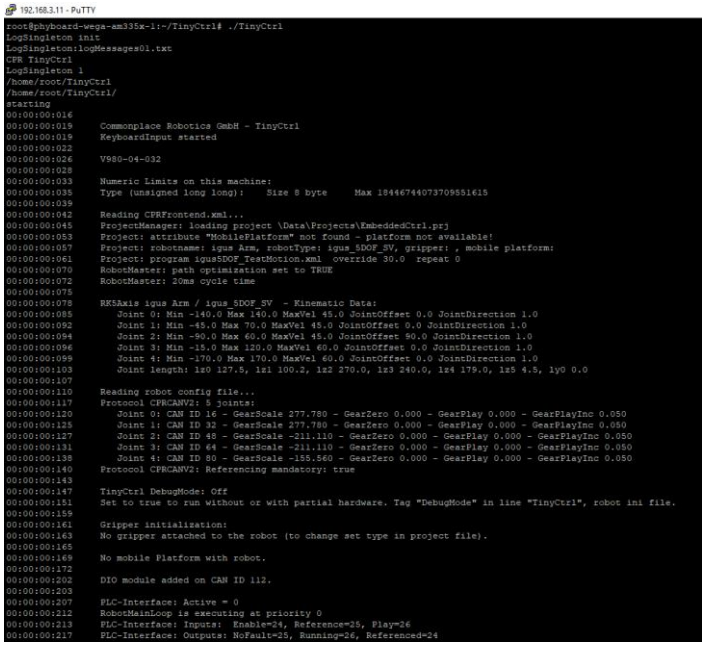
5. Once logged in, you are in the directory /home/robot or /home/root
   - The embedded equivalent of the CPRog/iRC software is called TinyCtrl. It is located here: /home/robot/TinyCtrl or /home/root/TinyCtrl
   - The directory structure within the TinyCtrl folder resembles the directory Structure of the CPRog/iRC folder on your PC.



6. To edit e.g. a robot configuration file use vi or nano
   - `vi /home/root/TinyCtrl/Data/Robots/igus_5DOF_SV/igus_5DOF_SV.xml` opens the configuration file of the 5-axis DCi robot.
   - A good summary of the commands available in vi can be found here: https://www.cs.colostate.edu/helpdocs/vi.html

7. After the configuration file has been edited and saved, the robot has to be restarted. One way to restart is to switch the robot off and on.

8. To monitor live log messages on the screen, re-establish the connection to the embedded control computer (steps 1-4).
   - Enter `killall TinyCtrl`
   - Navigate into the TinyCtrl directory: `cd TinyCtrl`
   - Start TinyCtrl: `./TinyCtrl`



9. The TinyCtrl process can be stopped via Ctrl+C
10. After a restart of the robot, the TinyCtrl software will start automatically as usual.