



xtc

2.4

Linux Thin Client Project

vmfree.org

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1 System requirements for xrc

Raspberry Pi:

- Raspberry Pi 4 or Pi 5
- SDMemory card with at least 16 GB storage space
- file `xrc.zip`

Ubuntu or a manual installation:

- Ubuntu server April 20
- file `xrcbin.tar.gz`

Optional:

- For Raspberry Pi 4:
One Nine Design Power HAT board & Case:
<https://www.raspberrypioplastics.com/power-hat-board>
Argon one case:
<https://www.argon40.com/argon-one-raspberry-pi-4-case.html>

2 Thanks

Thanks *Joe Fellner* for the splash screen.

Thanks *Jochen Hohlbaum* and *David Walter* for tests and suggestions.

Thanks *Matteo* for the italian translation.

Thanks *Michael Lowasser* for extensive testing and a lot of patience.

3 Release Notes

Release 1.0:

- Initial

Release 1.1:

- Supports Ubuntu 17.10 server
- New network interface

Release 1.2:

- Uses Raspbian Stretch Lite

Release 1.3:

- Remote administration with ssh
- Remote administration of the GUI mit VNC
- Bug fixes

Release 1.3.1:

- Bug fixes

Release 1.4:

- New version Raspbian Stretch Lite to support Raspberry Pi 3 Model B+
- Screen resolution and screen saver settings
- Alternative connections

Release 1.4.1:

- Own login for X2GO
- operating system Raspbian updated

Release 1.5:

- VPNconnection
- operating system Raspbian updated

Release 1.5.1:

- operating system Raspbian updated
- Version for Raspberry Pi 4

Release 1.6th:

- Supportt casing by One Nine Design with on / off switch for Raspberry Pi 4
- Supportt casing Argon 1 with on/off switch for Raspberry Pi 4

Release 1.7:

- Soundoutput via HDMI
- Automount USB Memory stick

Release 1.7.1:

- Uses Ubuntu 22.04 server
- Uses Raspberry Pi OS Mai 2020
- Raspberry Pi: Network configuration with dhcpcd.conf
- Tiger VNC replaced RealVNC

Release 1.8:

- Uses Raspberry Pi OS December 2020
- Dual monitor
- USB sound output
- Desktop icons
- Configuration without GUI
- Configuration date/time
- Timed actions

Release 1.9:

- Uses Raspberry Pi OS January 2021
- Save passwords encrypted
- Simple context menu
- No virtual consoles
- Password "root" and "thinclient" changeable
- Host name changeable
- Switch numeric keypad on/off

Release 1.9.1:

- Bug in thinclient-config
- Various bugs during shutdown configuration

Release 2.0:

- Bug fixing
- Print system CUPS
- WireGuard
- Overlay file system

Release 2.1:

- xfreerdp 3.0
- Parameters for RDP in GUI
- Forwarding webcam with RDP

Release 2.1.1:

- Raspberry OS May 2021
- Bug in WLAN password fixed
- Bug in OpenVPN connection fixed
- Display passwords

Release 2.1.2:

- Bug fixing
- New Version xfreerdp 3

Release 2.1.3:

- Bug fixing screensaver and standby
- Bug fixing initrd
- Italian language

Release 2.2:

- Raspberry OS Oct 2021
- One-time password with OpenVPN

Release 2.2.1:

- Raspberry Pi OS Lite (Legacy) April 2022
- Bug fixing VPN

Release 2.2.2:

- Raspberry Pi OS Lite May 2023
- Customizations for Ubuntu 22.04
- xfreerdp Release 2.10

Release 2.2.3:

- Run browser locally
- Customize background image

Release 2.3:

- Raspberry OS March 2023 now 64bit
- xfreerdp Release 3 Beta4

Release 2.3.1:

- Raspberry OS December 2023
- Ubuntu 23.10
- Ubuntu: xfreerdp Release 3.2
- Bug fix password encryption

Release 2.3.2:

- Bug fixes
- Data encryption

Release 2.3.3:

- Bug fixes (ping, ntp)
- Works with Raspberry Pi 5
- xfreerdp 3.5.1

Release 2.3.4:

- Bug fixes (ntp, network)
- xfreerdp3 Raspberry Pi 5: Redirect sound

Release 2.4:

- Bug fixes (monitor standby Raspberry Pi, data encryption)
- New screen saver (xscreenaver)
- Locking the input devices (keyboard, mouse, touchpad)
- Export/import connection data

4 Contact

If you have any questions, please contact: info@vmfree.org

5 Download

xrc can from www.vfmfree.org downloaded.

6 Installation for Raspberry Pi 4 or Pi 5

The file `xrc.zip` contains an image file which the operating system Includes Raspberry Pi OS and xrc. After writing the image to a memory card, xrc is immediately available.

Installation:

1. Download the file `xrc.zip` down.
2. Unzip the datei.
3. Copy the unzipped file `xrc.img` on the memory card.

With Linux, you can do this in the console:

```
sudo dd if=xrc/xrc.img of=<SD-memory card>
```

You can use the to determine under which name the memory card can be accessed
command `sudo fdisk -l`.

With Windows:

There are several tools for writing to an SD card. You can e.g.
`Win32Diskimager.exe` use.

4. Insert memory card in Raspberry Pi and turn on the Raspberry Pi.

7 Installation for Ubuntu

Unlike xrc for the Raspberry pi, xrc for Ubuntu contains only the application. To be able to install xrc, you have previously Ubuntu Server version 24.04 to be installed.

Note: you will need an internet connection, there during the installation Packages for xrc can be downloaded from the Internet

Installation:

1. Extract file: `tar xvfzp xrcbin.tar.gz`
2. Start installation: `sudo sh xrc/install.sh`
3. After the installationss restart the PC.

8 Service

The configuration of xrc is done via the "Thinclient" dialog, which is displayed after starting xrc.

From version 2.0 there are changes in the use of the administrator mode. This is now only available after a restart of xrc. The reason is that "overlayfs" is now used as read-only file system. This must be switched off before making any changes. This is only possible after a restart of the system. However, overlayfs is only used in the version for the Raspberry Pi. There is no read-only file system on Ubuntu.

Use admin mode only to configure xrc. Only in user mode, the system is read-only and thus protected from changes.

8.1 Administration mode

After installation, or if the **Start administrator mode** button has been selected in the **System** tab, xrc will run in administrator mode. Then all registers are available. To run the administrator mode, the administrator password must be entered (see the **Settings** tab).

8.2 User mode

If xrc is run in user mode (after clicking the **Start User Mode** button in the System tab) only the **Connect** and **System** tabs are available.

After selecting a mode, xrc restarts.

8.3 Changes configuration

After changes the configuration (network, hardware, etc.), the changes must be saved and xrc restarted. This is done with the button **Save and restart in** "Save" tab.

8.4 Message: Cannot read network settings

When starting xrc appears the message "Cannot read network settings ".

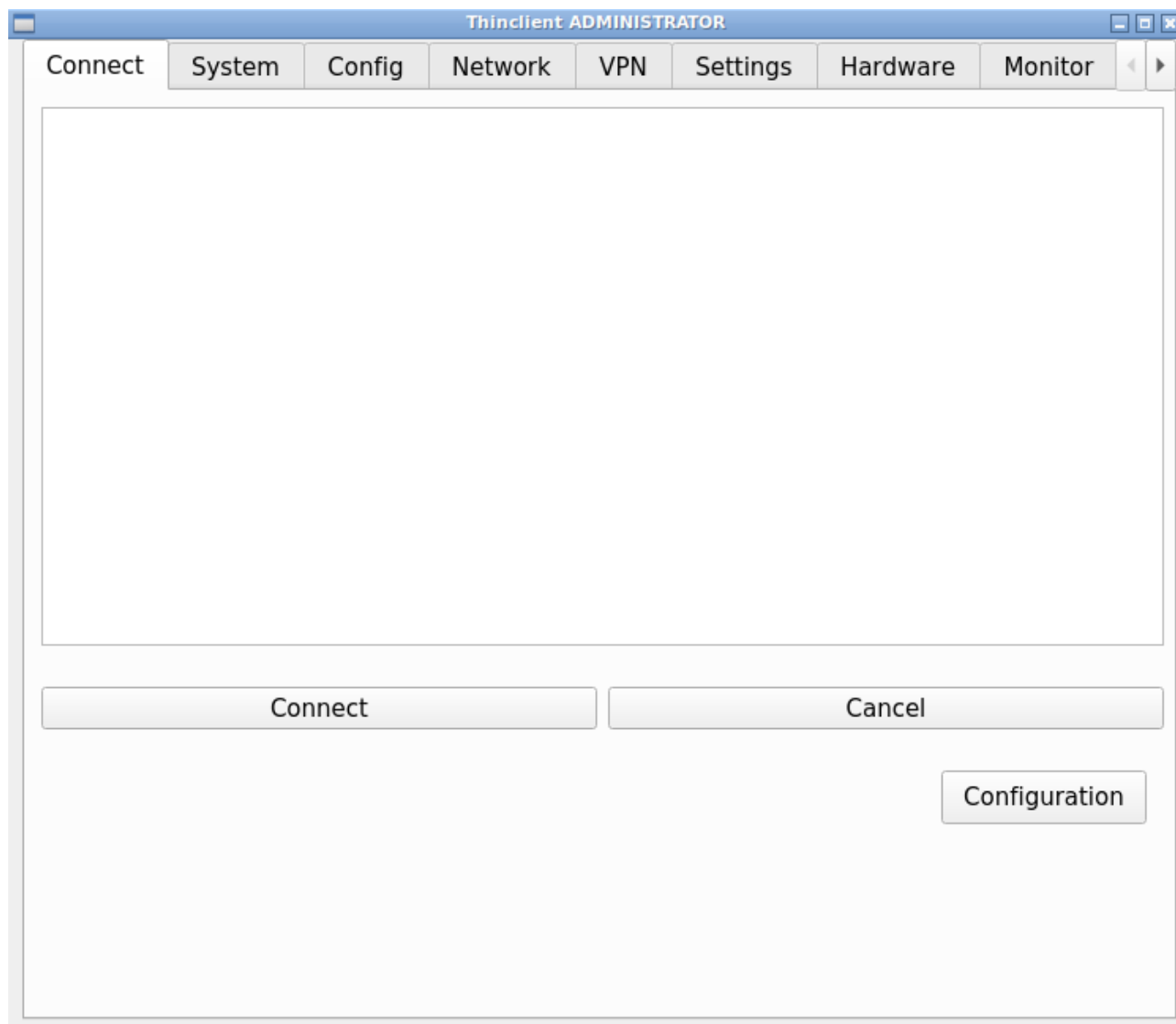


xtc cannot read the system's network settings. This can be the case if you use special network settings (e.g. network bundling).

You should then not save any network settings, otherwise the settings of your system will be overwritten.

9 Configuration

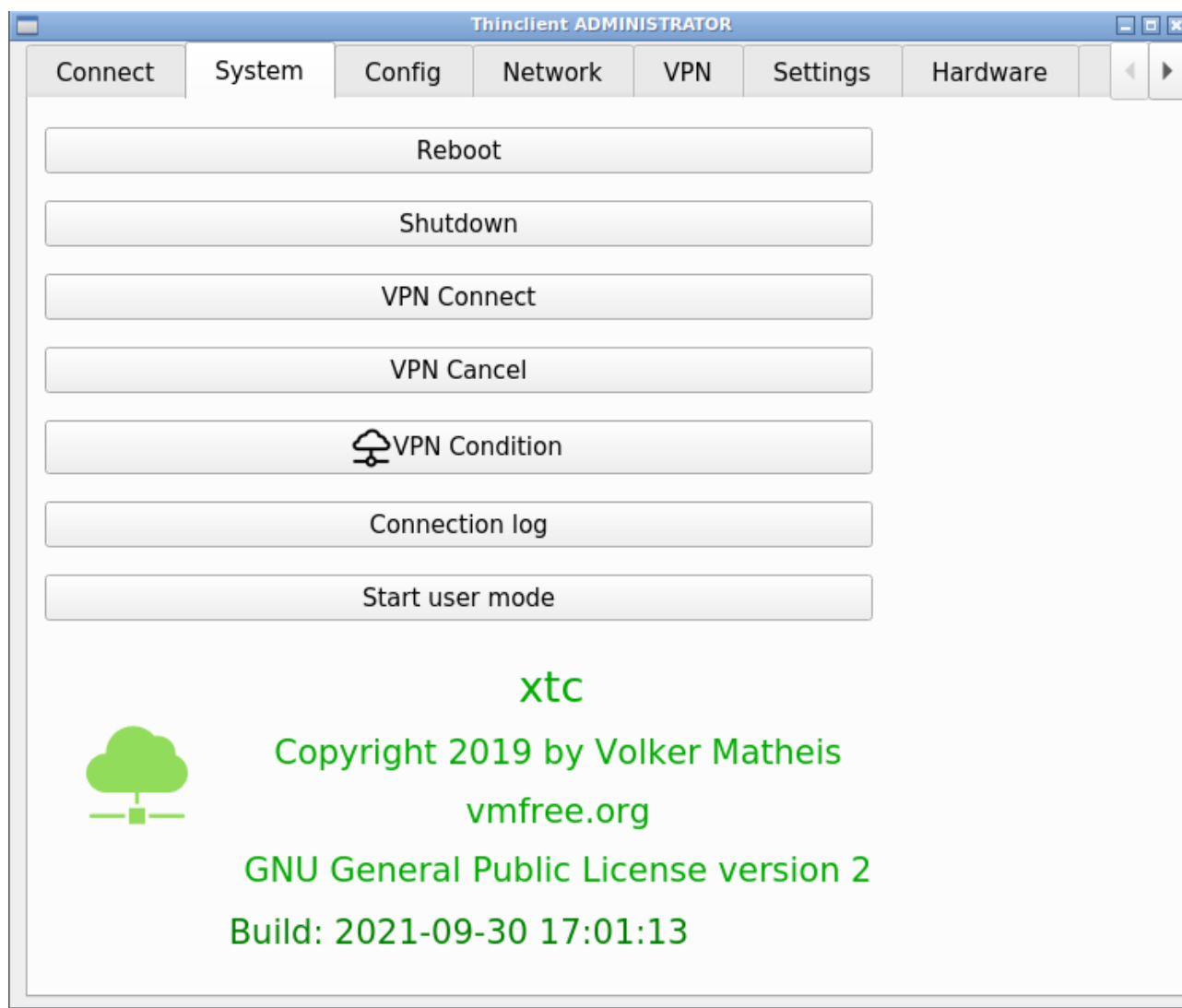
9.1 Connect tab



Configured connections are displayed. By double-clicking on a connection or by highlighting a connection and clicking the button `Connect`, a connection is established. If a connection is active, this is displayed as a green cloud to the left of the connection name. If you click the `Disconnect` button, an existing connection is terminated.

- **Configuration:** If the application is run in user mode (the `Configure` and `System` tabs are available), you can switch to administrator mode by clicking on this button and entering a password. Then all registers are available.

9.2 System tab

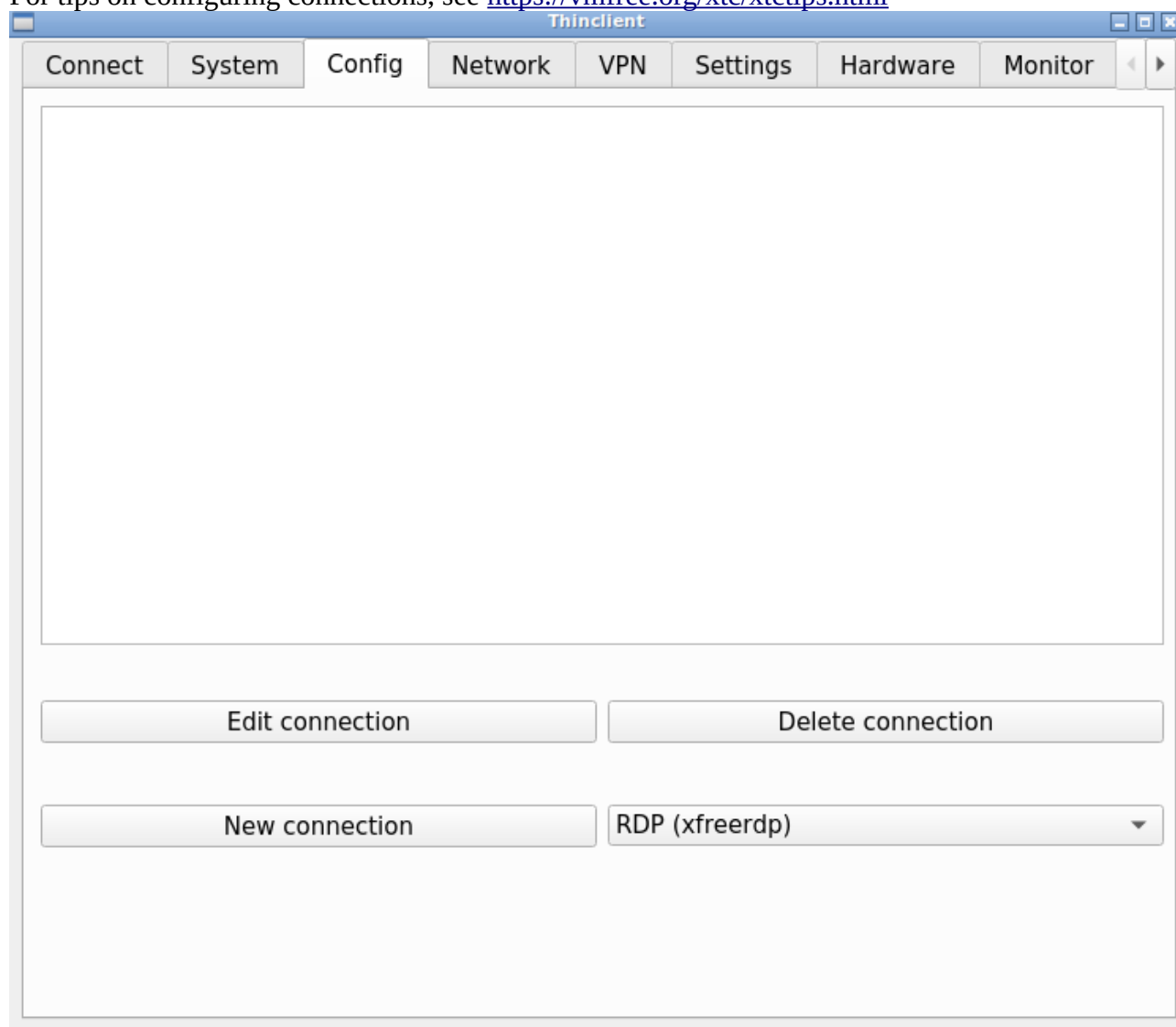


- **Reboot:** Clicking this button will restart the system.
- **Shutdown:** Clicking this button will shut down the system.
- **VPN Connect:** Click on this button to start a VPN connection. To configure the VPN connection, see section "VPN".
- **VPN Cancel:** Clicking this button will terminate an existing VPN connection. To configure the VPN connection, see section "VPN".
- **VPN Condition:** Clicking this button displays the status of a VPN connection. To configure the VPN connection, see section "VPN".
- **Connection log:** If a connection cannot be established, information is displayed by clicking this button.
- **Start user mode:** If xtc is running in administrator mode (ADMINISTRATOR is displayed in the title bar and all tabs are available) clicking this button will switch to user mode.

- **Start administrator mode:** If xhc is running in user mode (only the Connect and System tabs are available), clicking this button will switch to administrator mode. For this purpose, the administrator password must be entered.

9.3 Configure tab

For tips on configuring connections, see <https://vmfree.org/xtd/xtctips.html>



Be here the Connections established.

- **New connection:** In the selection field to the right of this button, the type of connection is first selected. Clicking this button opens a dialog with the parameters to be entered for the selected connection type.
- **Edit connection:** To change parameters of a connection, this must be marked in the selection list. Clicking this button opens the dialog with the parameters for the selected connection.
- **Delete connection:** To delete a connection, you must first mark it in the selection list. Clicking on this button removes the selected connection.

Depending on Type of There is a connection various Input fields. Example of an RDP connection:

- **Name:** Name of the connection. This name is used in the Connection overview displayed.
- **Address:** IP address or name of the server with which the connection is to be established.
- **Login name/User:** User name with which you want to connect to the server.
- **Password:** Password with which you want to connect to the server. The password is stored in encrypted form.
- **Domain (only RDP):** Domain name from the server.
- **Connect drives (RDP only):** Connected and connected USB drives (see **Hardware** tab) are displayed in the selection list. Select a drive to be connected to the RDP server.
- **Resolution:** Selection of Screen resolution, which is used for the client.
- **Color:** Selection of Color depth, which is used for the client.
- **Printer (RDP only):** If you have configured a printer in xrc (see section "Printer"), it can be selected here. This printer will then be passed on to the server.
- **USB devices (RDP only):** Selection of a connected USB device. This device will be forwarded to the server.
- **GDI (RDP only):** To improve the graphics output, select either "Hardware (hd) or Software (sw) here.
- **Glyph Cache (RDP only):** To improve the graphics output.
- **GFX (RDP only):** Enables GFX from Windows. To improve the graphics output.

- **RFX (RDP only):** Enables RemoteFX from Windows. To improve the graphics output.
- **Ignore Certificate (RDP only):** Do not perform certificate verification.
- **Clipboard (RDP only):** Forward the clipboard to the server.
- **Parameter selection (RDP only):** A selection list with frequently used parameters.
- **Further parameter:** Here you can additional Parameters are entered. These parameters are passed to the client program. To do this, read the documentation for the client programs.
- **System login (RDP only):** To display a dialog for querying the user name and password. The input is passed on to the server for login.
- **Autostart:** After starting xrc, the connection is established automatically.
- **Connect new:** After the connection is terminated, it is restarted.
- **Check host connection (RDP only):** Here you can choose whether to check whether a connection to the server is possible. For this purpose the program "ping" used. It is possible that the server does not support "ping". Then turn this test off.
- **Alternative:** Select an alternative connection here that should be established when the connection with dem server in these settings cannot be established.
- **Create icon:** This creates an icon on the desktop. A connection can be started with this symbol by double-clicking. This is an alternative to the connection list.
- **Icon name:** Enter the name for the desktop icon here.
- **Port (only ssh and XDMCP):** Port on the server.
- **Application (SSH only):** Desired application to be run on the server.
- **Keyboard layout (X2GO only):** Keyboard layout, which the client should use.
- **Desktop (only X2GO):** Desktop that is on the server is used.
- **Version 2 (RDP only):** Use version 2 of xfreerdp. This is the stable version of xfreerdp.
- **Version 3 (RDP only):** Use version 3 of xfreerdp. Use this version if you want to use a webcam. **Version 3 of xfreerdp is still under development and not all functions of the previous version have been implemented.**

To save the configuration, click the "OK" button.

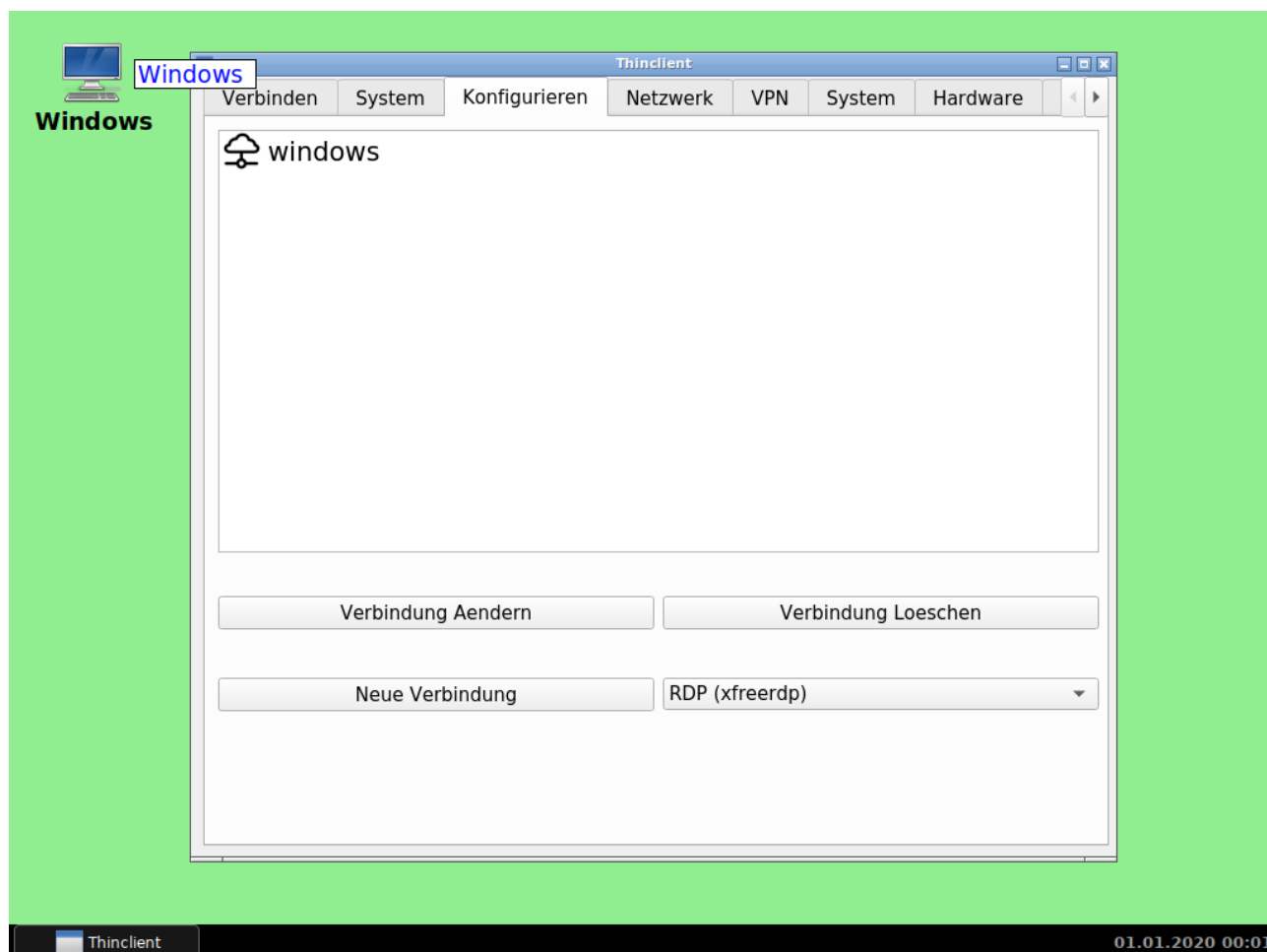
9.3.1 Establishing connections

For tips on configuring connections, see <https://vmfree.org/xrc/xtctips.html>

9.3.2 Start icons

With the button **Create icon** a start icon can be created. By double clicking with the left mouse button the connection starts. The icon can be moved by clicking with the right mouse button. To remove the icon again, remove the check mark from the **Create icon** button in the corresponding connection.

Screen with icon:



9.3.3 Connection software

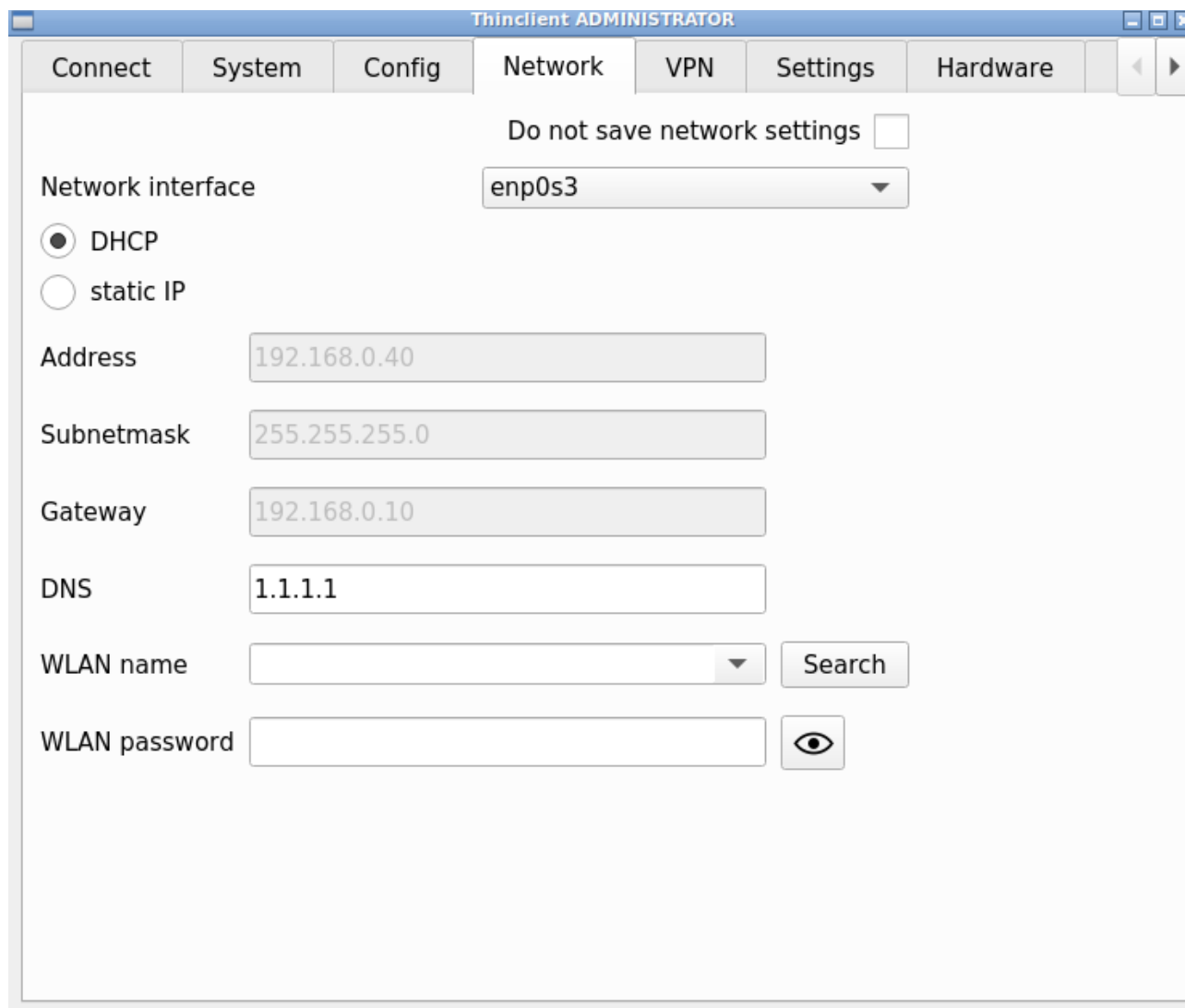
These applications are used for the connections:

Connectdungsart	Uses Clientprogram
RDP	xfreerpd, rdesktop
VNC	tigervncviewer
X2GO	pyhoca-cli
SSH	ssh
XDMCP	xephyr

9.3.4 Browser

A special feature is the connection type "Browser". One of the locally installed browsers is used. This provides Internet access on the PC or Raspberry Pi without having to connect to a connection server.

9.4 Network tab




The screenshot shows the 'Thinclient ADMINISTRATOR' window with the 'Network' tab selected. The window has a title bar with standard window controls. Below the title bar is a tabbed interface with tabs for 'Connect', 'System', 'Config', 'Network' (active), 'VPN', 'Settings', and 'Hardware'. The 'Network' tab contains the following configuration options:

- Do not save network settings:** A checkbox that is currently unchecked.
- Network interface:** A dropdown menu showing 'enp0s3'.
- Connection type:** Two radio buttons: 'DHCP' (selected) and 'static IP'.
- Address:** A text input field containing '192.168.0.40'.
- Subnetmask:** A text input field containing '255.255.255.0'.
- Gateway:** A text input field containing '192.168.0.10'.
- DNS:** A text input field containing '1.1.1.1'.
- WLAN name:** A text input field with a dropdown arrow, followed by a 'Search' button.
- WLAN password:** A text input field with an eye icon for toggling visibility.

The network connection for the system is configured here.

- **Do not save network settings:** If you have network settings that should not be changed, put a tick here. The tick is set automatically if network settings cannot be read by xTC.
- **Network interface:** Here, select the network connection with which a connection is to be established. The network connection depends on the network types installed.
- **DHCP, static IP:** Select how the network connection should be set up.
- **Address:** Enter the IP address that the system should receive here.
- **Subnetmask:** Enter the network mask here.

- **Gateway:** If required, enter a gateway here.
- **DNS:** If necessary, enter one or more name servers here.
- **WLAN name:** Enter the name (SSID) of a wireless network here if you want to set up a network connection with WLAN. Or select an SSID from the list.
- **Search:** Searches for WiFi in your area again.
- **WLAN password:** Enter the password of the wireless network here if you want to set up a network connection with WLAN.
- Click  to view the password.

9.5 VPN tab

The screenshot shows the 'VPN' tab in the 'Thinclient ADMINISTRATOR' application. The interface includes a menu bar with tabs: Connect, System, Config, Network, VPN (selected), Settings, Hardware, Monitor, Date/Time, and Remote. Below the menu bar, there are two radio buttons: 'Open VPN' (selected) and 'Wireguard'. The 'Open VPN' section contains several input fields and buttons: 'Parameterdatei' with a text box, an ellipsis button, and a red 'X' button; 'Further parameter' with a text box; 'Additional Files' with a button; 'Run with' with a text box, an ellipsis button, and a red 'X' button; 'System login' with a checkbox; 'Autostart' with a checkbox; and 'One-time password' with a checkbox.

A VPN connection can be set up via the "VPN" tab. Open VPN and WireGuard are supported as VPN clients.

- **Parameter file:** Save the configuration file for OpenVPN or Wireguard here. The configuration file is saved in the `/data/user/vpn` folder. The file is saved with the name `vpn.ovpn` for OpenVPN and `wg0.conf` for Wireguard. Click on the "X" button to remove the file again.
- **Other parameters:** If you want to pass parameters to OpenVPN or Wireguard, enter them here.
- **Additional files:** save any additional files that OpenVPN or Wireguard needs from here (for example, certificate files).
- **Run with:** If you have your own script to start OpenVPN or Wireguard, you can save it here. This is necessary, for example, if transfer parameters to the VPN server must be in a certain format. The script is saved in the folder `/data/user/vpn` and gets the file name `vpn.sh`. Click on the "X" button to remove the file again.

- **Own login:** If you select this checkbox, the login data will be requested when the VPN connection is established.
- **Start automatically:** Select this checkbox, the VPN connection will be established automatically when xhc is started.
- **One-time password:** If you select this checkbox, a one-time password will be requested in addition to the user name and password when establishing the VPN connection.

9.5.1 Copy files

Files can be copied to xhc using a USB stick. To do this, activate the Connect USB automount switch in the Hardware tab. You can also copy data to xhc with scp. To do this, activate the Allow access ssh function in the Settings tab.

9.5.2 Own VPN script

In the folder /opt/thinclient/config there is the template vpn.sh to create your own VPN script.

Important: The results of the VPN connection must be written to a file. The file name for the log file is contained in \$output.

9.6 Prerequisites

A parameter file for openvpn or wireGuard is required for a VPN connection.

9.7 Installation with USB stick

Insert the USB stick with the required files into a free USB port.

9.7.1 Copying the parameter file

1. First select the VPN client: OpenVPN or WireGuard.
2. click the button ...
3. select the /data/user/usb folder in the file manager.
4. Select the parameter file for Open VPN or WireGuard.
5. Click the Open button.
6. the file is now copied to the /data/user/vpn folder. If you have selected OpenVPN as the VPN client, the file is then named vpn.ovpn. If you have selected WireGuard as the VPN client, the file has the name wg0.conf.

9.7.2 Copy other files

1. Click the button Additional files.
2. Select in the file manager the folder /data/user/usb.
3. Select the desired file in the file manager.
4. Click the button Open.
5. The selected file is now copied to the folder /data/user/vpn copied.
6. Repeat the process for all of them required Files.

Note for Ubuntu: Your system may have a different drive label for the USB drive. Is given `/dev/sda1`. If that doesn't work, change the scripts
 `/opt/thinclient/script/mountusb.sh`
 `/opt/thinclient/script/umountusb.sh`
the desired drive from.

9.7.3 Installation with scp

You can also copy the required files to xhc with scp. To do this, ssh access must be activated. See section "Settings tab".

Copying files to xhc with scp on Linux

Open a shell on your Linux PC and enter this command:

```
scp <file to be copied> thinclientssh@ <IP address>
```

```
xhc>:/data/user/vpn
```

Example:

```
scp test.ovpn thinclientssh@ 192.168.0.42:/data/user/vpn
```


You need the password of the user thinclientssh enter that you have previously assigned in xhc.
The files must be in the folder / data / vpn copied.

- **Further parameters:** Here you can enter further parameters which should be executed when starting openvpn. Please refer to the openvpn documentation for the syntax of the parameters.
- **Delete files:** With this button files from the folder /data/user/vpn to be deleted.
- **System login:** Select "Own login" if the user name and password should be entered when starting the OpenVPN connection.
- **Start automatically:** Select "Start automatically" if the VPN connection should be started automatically when xhc starts.

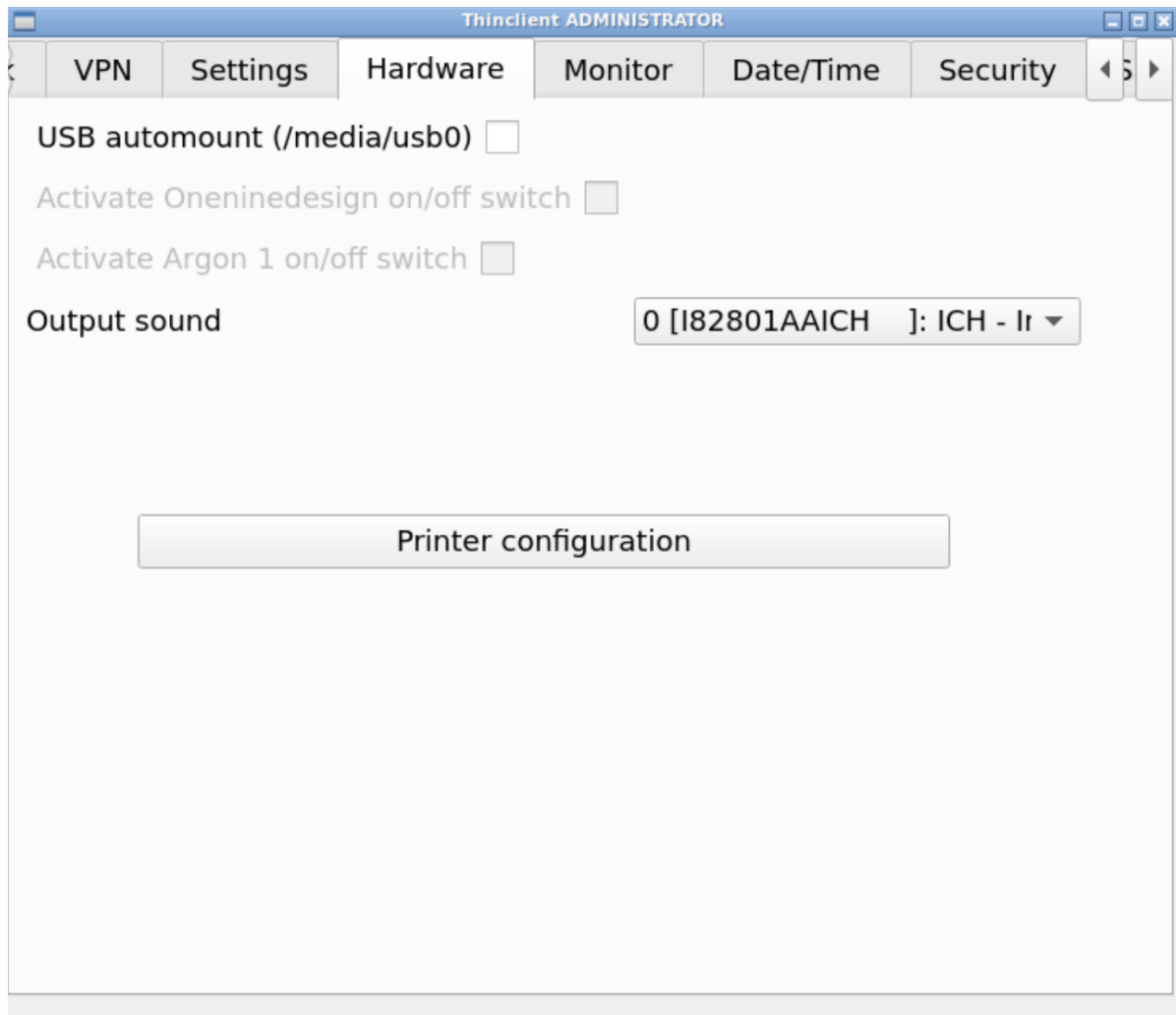
To create or end a VPN connection, use the corresponding buttons. See "System tab".

9.8 Settings tab

- **Terminal:** Click this button to start a console.
- **System name:** Enter a system name (hostname) for the system.
- **Start dialog minimized:** When starting xrc, the dialog is minimized in the panel.
- **Taskbar visible:** The taskbar can be hidden by removing the checkmark.
- **Language:** Select the here Displaypronounced.
- **Enable numeric keypad:** If a check mark is set, the numeric keypad will be switched on when xrc is started.
- **Show volume control:** Shows an icon in the taskbar to control the volume. See section "Adjusting the volume".
- **Keyboard layout:** Choose here die Assignment of the keyboard.
- **Password admin:** Enter a password here for the administrator mode. If the application starts in user mode, you can after input this Password to access all tabs. To enter the password, click on the tab "Connect" button **Extended**.
- Click to view the password.
- **Allow connection VNC:** If this function is switched on, the graphical user interface of xrc can be managed from another PC. To do this, a VNC client (e.g. RealVNC) must be installed on this PC. For Linux a call from the console could look like this:
vncviewer <IP address xrc>:0
- **Password VNC connection:** If the access with VNC is allowed, so a password can be assigned. The password is required for the VNC client to establish the connection.
- Click to view the password.
- **Allow connection ssh:** If you activate this function, the system started an ssh server. This means that with an ssh clients can access xrc. The user name for ssh is "thinclienssh".

- Password ssh, Repeat Password: If the access with ssh is allowed, so a password can be assigned. The password is required for the ssh client to establish the connection.
- **Password ssh:** Enter a password.
- Click  to view the password.

9.9 Hardware tab



- **USB automount:** Check this box if a USBMemorytick should be connected automatically. D.he USB stick we then with the folder / media / usb0 vbound. The USB memory stick mustss with the VFAT file system (Windows file system) be formatted.
- **Activate Oneninedesign on/off switch:** Use one **Raspberry Pi 4** with the case from **oneninedesign** with built-in on/off switch, check this box so that you can use the on/off switch.
- **Activate Argon 1 on/off switch:** Use one **Raspberry Pi 4** with dem case **argon One** with built-in on/off switch, check this box so that you can use the on/off switch.
- **Output sound:** You use this selection to specify the device on which the sound should be output. The default output is via HDMI.
- **Printer configuration:** Click this button to configure a printer (see chapter "Printer").

9.10 Monitor tab

The screenshot shows the 'Monitor' tab in the 'Thinclient ADMINISTRATOR' application. The window has a title bar with standard OS controls and a menu bar with the following tabs: Connect, System, Config, Network, VPN, Settings, Hardware, Monitor (selected), Date/Time, and Remote. The main configuration area includes:

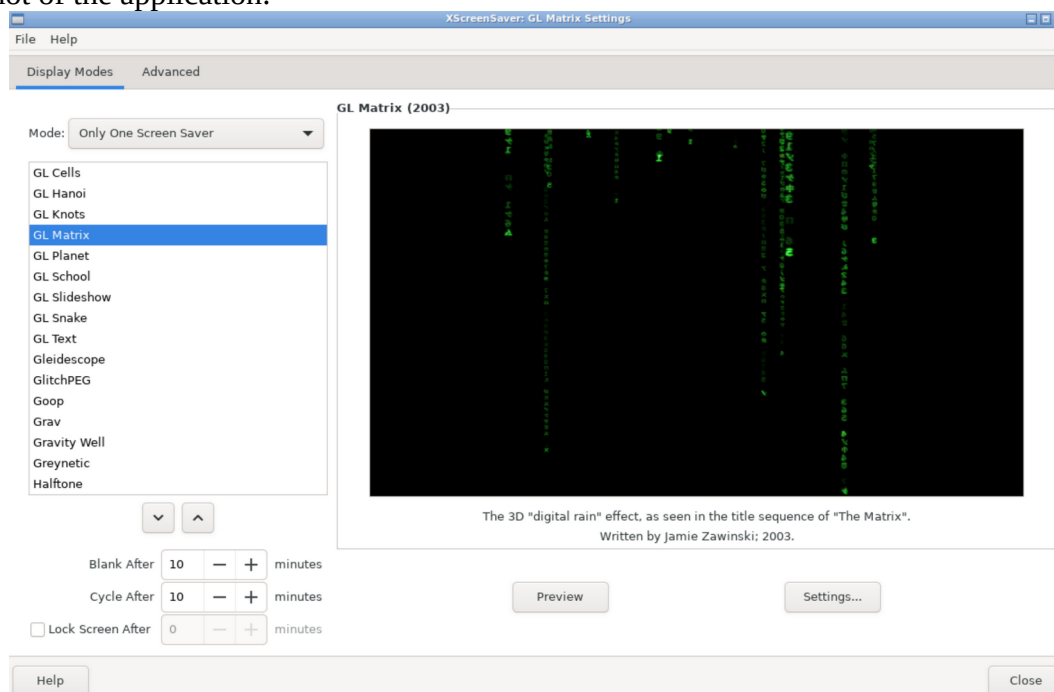
- Screensaver:** A checkbox that is currently unchecked, followed by a 'Configure' button.
- Monitor standby:** A checkbox that is currently unchecked.
- Resolution:** A dropdown menu showing '1280x800'.
- Resolution monitor 2:** A dropdown menu showing 'auto'.
- Enable dual monitor:** A checkbox that is currently unchecked.
- Position Monitor 1:** A group box containing four radio buttons: 'Left' (unselected), 'Right' (selected), 'Above' (unselected), and 'Below' (unselected).
- Optimize graphic:** A checkbox that is currently unchecked.
- Background image:** A text input field followed by a button with three dots and a red 'X' icon.
- Background color:** A text input field showing the hex code '#90EE90'.

- **Screensaver:** If the check mark is set, you activate the screen saver.
- **Configure:** Click this button to start the application for configuring the screensaver.
- **Monitor standby:** If the checkmark is set, the screen is switched off after 10 minutes without any action.
- **Resolution:** Choose The screen resolution here out. If "auto" is selected, the standard resolution of the monitor is used.
- **Resolution Monitor 2:** If a second monitor is connected, you can select the screen resolution of this monitor here. If "auto" is selected, the standard resolution of the monitor is used.
- **Enable dual Monitor:** Activate this checkbox if you want to connect a second monitor. This is not possible for all systems. Therefore, check beforehand whether your system works with a second monitor.
- **Position monitor 1:** Specify where the logical position of the 1st monitor should be. This only makes sense if a second monitor is connected.

- **Optimize graphics:** Only for Raspberry Pi 3. If there are problems with the graphics output with RDP, activate checkbox. This will not load the driver "vc4-fkms-v3d". The driver is required for dual monitor operation.
- **Background image:** By clicking on the button the open dialog appears. Select a graphic file as background image. The file must be stored in the /data/user/thinclient folder. Click on the "X" button to remove the file again.
- **Background color:** Enter a background color here. The input is in hexadecimal notation. There are sites on the Internet that convert colors to hex code.

9.10.1 Configuring the screensaver

Click on the Configure button to start the XscreenSaver application. XscreenSaver is a free screen saver. You can select different screen savers or set times when the screen saver is to become active. There are also a number of other parameters to adjust the behavior of the screensaver. Here is a screenshot of the application:



Further information can be found on the homepage for this screensaver:

<https://www.jwz.org/xscreensaver/>

9.11 Date/Time tab

The screenshot shows the 'Date/Time' tab of the 'Thinclient' application. The interface includes a tab bar at the top with 'Network', 'VPN', 'Settings', 'Hardware', 'Monitor', 'Date/Time', 'Security', and 'Save'. The 'Date/Time' tab is active. Below the tab bar, there are several settings:

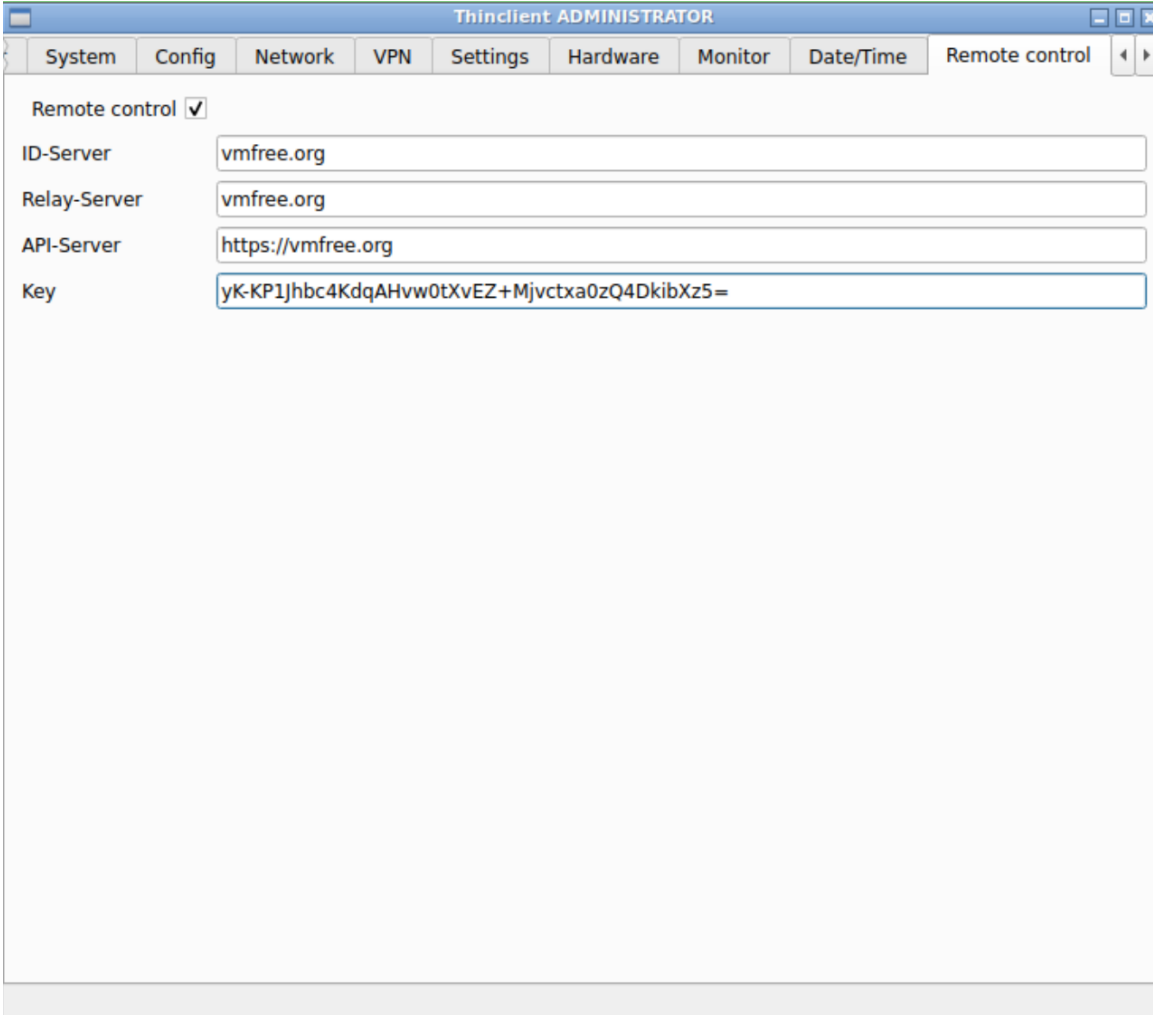
- Do not change date and time** ☐
- Show date and time** ☒
- Set date and time automatically** ☐
- Date and time**
- Time server**
- Time zone**
- Action**
 - Execute action** ☐
 - Repeat action** ☐
 - Action**
 - Execute at**
 - Last action**

- **Do not change the date and time:** The date and time from the system are not changed if the checkmark is set.
- **Show date and time:** The date and time will be displayed in the system tray if the check mark is set.
- **Date and time automatically:** If the checkmark is set, the time is set automatically. A time server and a time zone must then be selected for this.
- **Date and time:** A date and time can be entered here. When xTC is started, this is the date and time used as the start time. The date and time must be entered in the format year-month-day hour: minute (example: 2020-12-30 13:40)
- **Time Server:** Enter the name of an NTP server here. Only useful if the date and time is switched on automatically.
- **Time zone:** Select a time zone here. Only useful if the date and time is switched on automatically.

- **Execute action:** xhc can perform an action at a specific time. This is done when the check mark is set.
- **Repeat action:** If the check mark is set, the action is repeated.
- **Action:** Select what action to take.
- **Execute at:** Enter a date and time when the action should be carried out. The date and time must be entered in the format year-month-day hour: minute Example: 2020-12-30 13:40. A time can also be entered in the form hour: minute. The entry is successful then begins with the "+" sign. Example: +03: 15. Means the action will be taken in 3 hours and 15 minutes.
- **Last action:** The date and time of the last action performed is displayed here.

9.12 Remote control tab

Enter the connection parameters for remote access in the Remote access tab. RustDesk is used as the application. RustDesk is free software for the graphical remote control of computers. You can operate your own RustDesk server. Further information can be found on the provider's homepage: <https://rustdesk.com/de/>

The screenshot shows the 'Thinclient ADMINISTRATOR' window with the 'Remote control' tab selected. The 'Remote control' checkbox is checked. Below it, there are four input fields: 'ID-Server' with 'vmfree.org', 'Relay-Server' with 'vmfree.org', 'API-Server' with 'https://vmfree.org', and 'Key' with 'yK-KP1Jhbc4KdqAHvw0tXvEZ+Mjvctxa0zQ4DkibXz5='.

Thinclient ADMINISTRATOR	
System	Config
Network	VPN
Settings	Hardware
Monitor	Date/Time
Remote control	
Remote control <input checked="" type="checkbox"/>	
ID-Server	vmfree.org
Relay-Server	vmfree.org
API-Server	https://vmfree.org
Key	yK-KP1Jhbc4KdqAHvw0tXvEZ+Mjvctxa0zQ4DkibXz5=

Remote access: Check the box to enable remote access.

ID server, Relay server, API server: Enter the name of the Rustdesk server you want to connect to here.

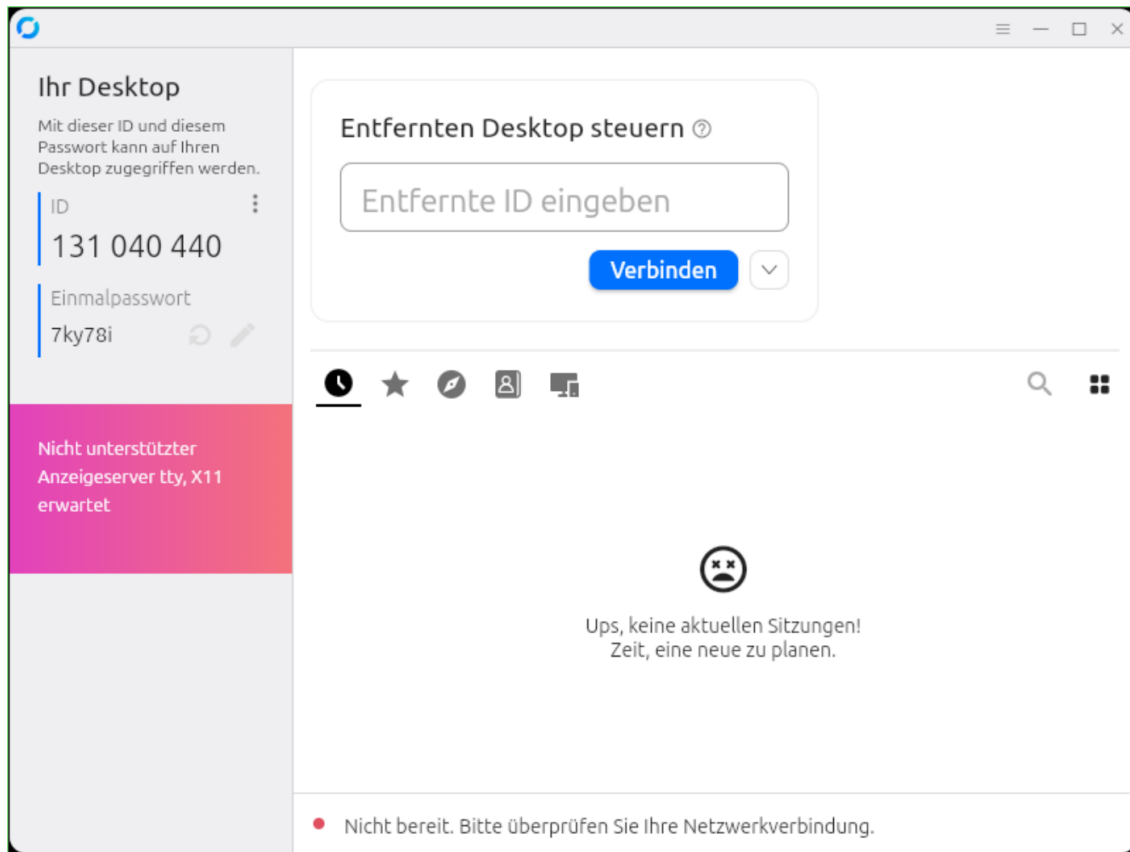
Key: Enter the key you received from the Rustdesk server you want to connect to.

9.12.1 RustDesk Client

After activating remote access, an icon representing a computer appears in the panel:



Click on this icon to start remote access. The RustDesk client then appears on the screen:



To establish the connection with your computer, the connection partner must also start their RustDesk client. Then tell your partner the ID and the one-time password. The partner can then connect to your computer. If you want to end the connection, close the client.

9.13 Security tab

Thinclient ADMINISTRATOR

g Network VPN Settings Hardware Monitor Date/Time Remote control Security Save

Simple context menu ☐

No virtual consoles ☐

Password root

Password user thinclient

Encrypt data ☐

Password encrypt

Repeat password

Keyboard lock ☐

Unlock file ...

Verbindungsdaten exportieren Verbindungsdaten importieren

These settings can be used to improve the security of xtc.

- **Simple context menu:** If this box is checked, all commands are no longer available in the context menu (see also chapter "Context menu").
- **No virtual consoles:** If this field is checked, it is no longer possible to switch to a console with the key combination <Alt> + <F-key>.
- **Password root:** You can enter a new password for the "root" user here.
- **Repeat password:** The input from the password must be repeated here.
- **Password user thinclient:** You can enter a new password for the user "thinclient" here. xtc will be executed as user "thinclient".
- Click to view the password.
- **Encrypt data:** Check this box if you want the connection data to be encrypted.
- **Password encryption/repeat password:** Enter the password for the encryption here if you have ticked the Encrypt data box.
- **Keyboard lock:** Check the box if the input devices (keyboard, mouse, touchpad) should be locked.

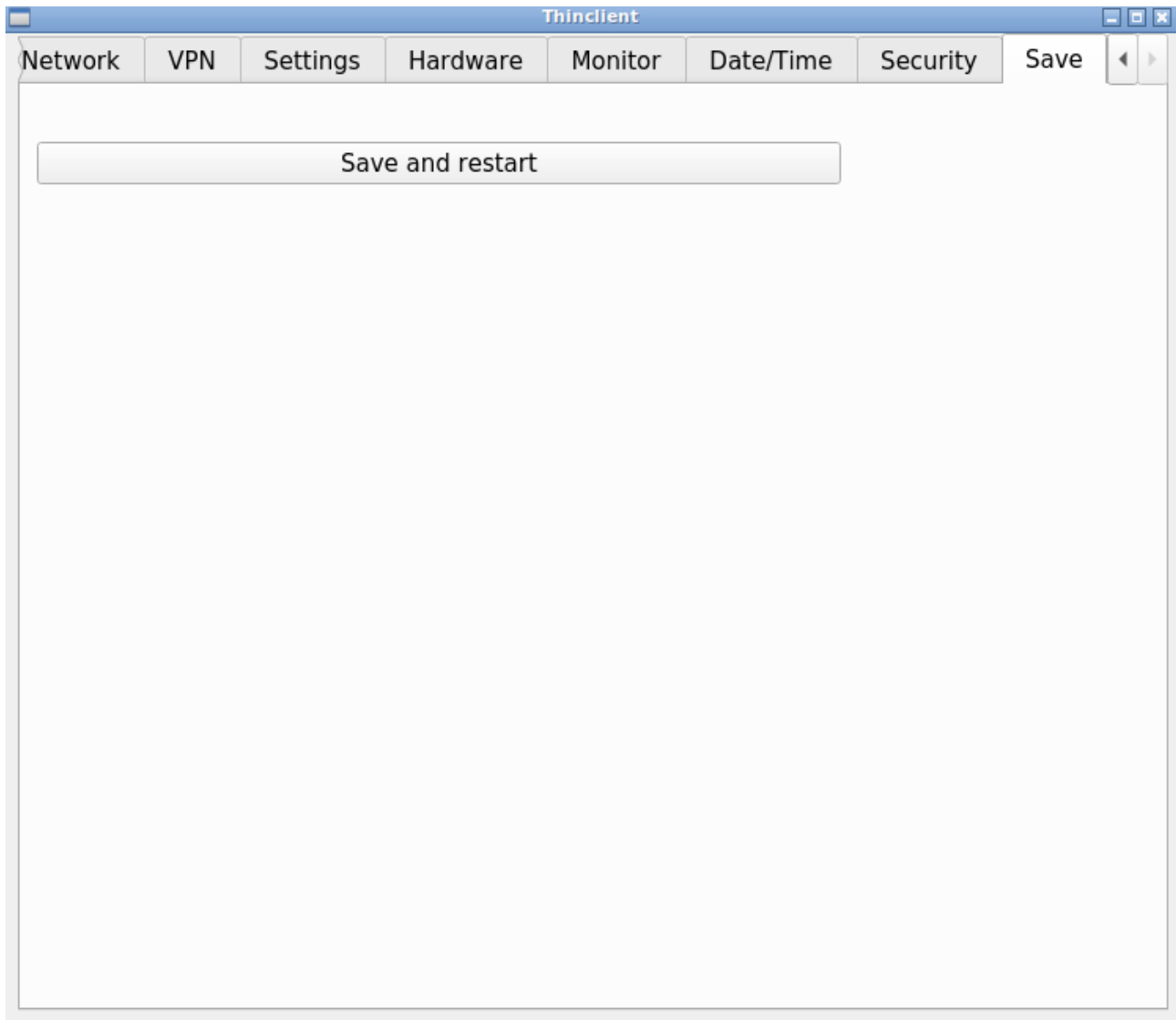
- **Unlock file:** The input devices are unlocked again using a file. Select the file with which the lock is unlocked. To do this, click on the button with the three dots and select the desired file. You can remove the file again by clicking on the “X” button.
- **Export connection data:** By clicking on this button, you can save the connection.conf file, which contains your connection data.
- **Import connection data:** By clicking on this button, you can import a saved file with connection data into xhc.

9.13.1 Keyboard lock function

Select a file on a USB stick as the unlock file. If the keyboard lock is activated and you remove the USB stick, the input devices are locked and a corresponding dialog appears on the screen stating that you need a USB stick to remove the keyboard lock.

Attention: Activate the “USB automount” function to use a USB stick.

9.14 Save tab



The “Save” tab has only one button area:

Save and restart

After changes in the configuration must **Save and restart** are executed.

Note: Saving and restarting do not have to be carried out when a new connection is created.

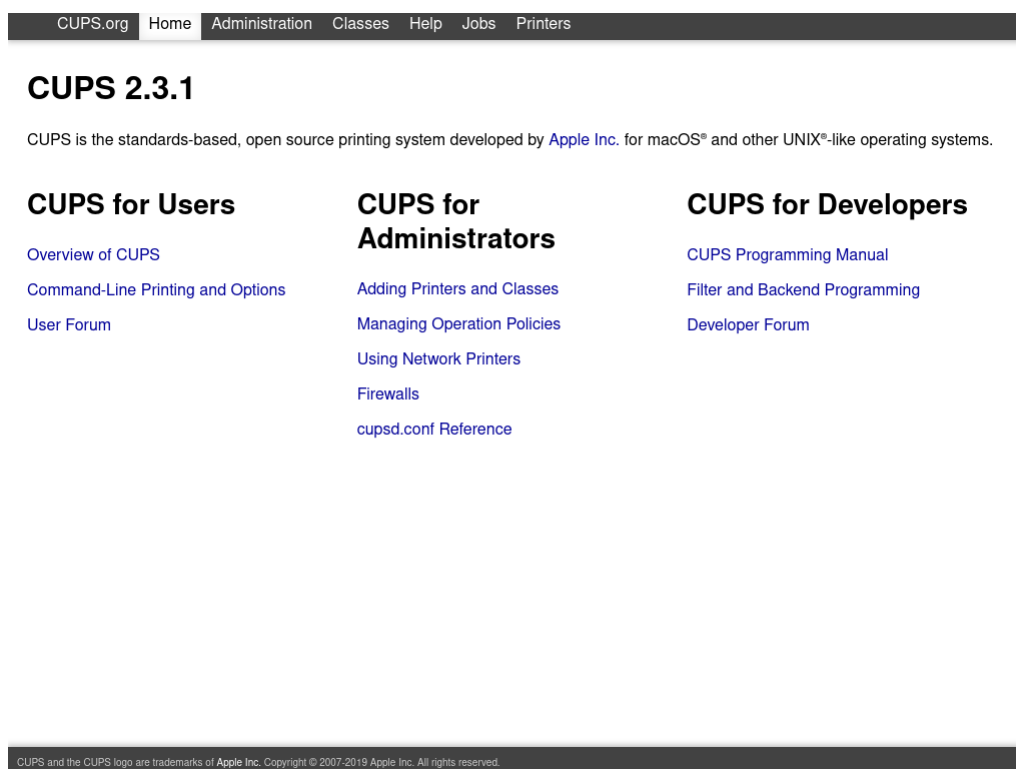
10 Printer

xhc can manage locally connected printers. These can be passed on to the system using RDP, for example.

For printer management, xhc uses the CUPS printing system. The configuration is done in a browser. After clicking the "Set up printer" button, CUPS is started in the Firefox browser. You can end the printer configuration at any time with the keys Ctrl and Q.

10.1 Add printer

Click the "Printer configuration" button in xhc. Then CUPS will start in the browser:



Click "Administration". Then this screen appears:

The screenshot shows the CUPS Administration web interface. At the top is a navigation bar with links: CUPS.org, Home, Administration (selected), Classes, Help, Jobs, and Printers. The main content area is titled "Administration" and is divided into three sections: Printers, Classes, and Jobs. The Printers section has buttons for "Add Printer", "Find New Printers", and "Manage Printers". The Classes section has buttons for "Add Class" and "Manage Classes". The Jobs section has a button for "Manage Jobs". To the right of these sections is a "Server" section with a button for "Edit Configuration File". Below the "Server" section is a "Server Settings" section with a link for "Advanced" and several checkboxes: "Share printers connected to this system" (unchecked), "Allow printing from the Internet" (unchecked), "Allow remote administration" (unchecked), "Use Kerberos authentication (FAQ)" (unchecked), "Allow users to cancel any job (not just their own)" (unchecked), and "Save debugging information for troubleshooting" (unchecked). At the bottom of the page is a footer with the text: "CUPS and the CUPS logo are trademarks of Apple Inc. Copyright © 2007-2019 Apple Inc. All rights reserved."

Click "Add Printer".

The screenshot shows the CUPS Administration web interface with a login dialog box overlaid. The dialog box has a title bar that says "http://localhost:631 is requesting your username and password. The site says: 'CUPS'". It contains two input fields: "User Name:" and "Password:". Below the input fields are two buttons: "Cancel" and "OK". The background of the page is dimmed, showing the same "Administration" interface as the previous screenshot.

To be allowed to create a printer, you need the necessary rights. To do this, you must create a user. Log them in as user thinclient:

User Name: thinclient

Password: thinclient (if you have not changed the password)

The password can be changed in the Security tab.

CUPS searches for connected printers. If the printer is not found, you can create it manually.

CUPS.org Home Administration Classes Help Jobs Printers

Add Printer

Add Printer

Local Printers: ☐ CUPS-BRF (Virtual Braille BRF Printer)
☐ HP Printer (HPLIP)
☐ HP Fax (HPLIP)

Discovered Network Printers: ☐ HP Officejet Pro 8610 [5EAC55] (HP Officejet Pro 8610)
☐ HP Officejet Pro 8610 (HP Officejet Pro 8610)
☐ HP Officejet Pro 8610 (driverless) (HP Officejet Pro 8610)

Other Network Printers: ☐ Internet Printing Protocol (https)
☐ Internet Printing Protocol (ipp)
☐ Backend Error Handler
☐ Internet Printing Protocol (http)
☐ Internet Printing Protocol (ipps)
☐ AppSocket/HP JetDirect
☐ LPD/LPR Host or Printer

Continue

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After selecting the printer, click "Continue". Now you need to give the printer a name:

CUPS.org Home Administration Classes Help Jobs Printers

Add Printer

Add Printer

Name:
(May contain any printable characters except "/", "#", and space)

Description:
(Human-readable description such as "HP LaserJet with Duplexer")

Location:
(Human-readable location such as "Lab 1")

Connection: socket://192.168.0.9:9100|HP Officejet Pro 8610

Sharing: ☐ Share This Printer

Continue

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After entering a name, click "Continue":

Set Printer Options

Set Default Options for HP_Officejet_Pro_8610

[General](#) [Banners](#) [Policies](#)

General

Media Size:	<input type="text" value="A4"/>
Media Type:	<input type="text" value="Stationery"/>
Print Color Mode:	<input type="text" value="Color"/>
2-Sided Printing:	<input type="text" value="Off"/>
Print Quality:	<input type="text" value="Normal"/>
Print Optimization:	<input type="text" value="Automatic"/>
Print Rendering Intent:	<input type="text" value="Automatic"/>
Print Scaling:	<input type="text" value="Automatic"/>
<input type="button" value="Set Default Options"/>	

Now you can still change various parameters. Click "Set Default Options" to apply the settings.

CUPS.org Home Administration Classes Help **Jobs** Printers

HP_Officejet_Pro_8610

[HP_Officejet_Pro_8610](#) (Idle, Accepting Jobs, Not Shared)

Maintenance Administration

Description: HP Officejet Pro 8610

Location:

Driver: HP Officejet Pro 8610, driverless, cups-filters 1.27.4 (color, 2-sided printing)

Connection: socket://192.168.0.9:9100

Defaults: job-sheets=none, none media=iso_a4_210x297mm sides=one-sided

Jobs

Search in HP_Officejet_Pro_8610:

Jobs listed in print order; held jobs appear first.

The printer is now created in the system and can be used:

On the Internet you can find more documentation about the Linux printing system CUPS.

10.2 Error handling

If the printer does not respond, you can see in the job list if print jobs are not yet done. You can then delete print jobs via "Cancel". To do this, click on "Jobs":

[CUPS.org](#) [Home](#) [Administration](#) [Classes](#) [Help](#) [Jobs](#) [Printers](#)

Jobs

Search in Jobs:

Jobs listed in print order; held jobs appear first.

ID	Name	User	Size	Pages	State	Control
HP_Officejet_Pro_8610-1	Unknown	Withheld	1k	1	processing since Fri Apr 16 06:54:33 2021 "Rendering completed"	<input type="button" value="Cancel Job"/> <input type="button" value="Move Job"/>

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You can also start a test print or stop and restart a printer. To do this, click on "Printers" and click on the desired printer. Via "Maintenance" you can perform the mentioned actions.

[CUPS.org](#) [Home](#) [Administration](#) [Classes](#) [Help](#) [Jobs](#) [Printers](#)

HP_Officejet_Pro_8610

HP_Officejet_Pro_8610 (Idle, Accepting Jobs, Not Shared)

Maintenance

Administration

Description: HP Officejet Pro 8610

Location:

Driver: HP Officejet Pro 8610, driverless, cups-filters 1.27.4 (color, 2-sided printing)

Connection: socket://192.168.0.9:9100

Defaults: job-sheets=none, none media=iso_a4_210x297mm sides=one-sided

Jobs

Search in HP_Officejet_Pro_8610:

Jobs listed in print order; held jobs appear first.

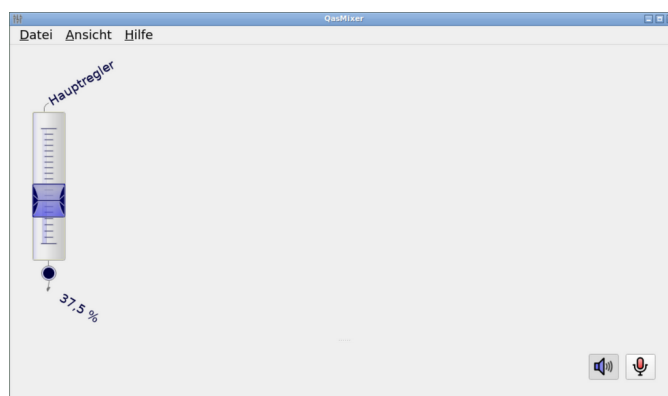
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11 Panel applications

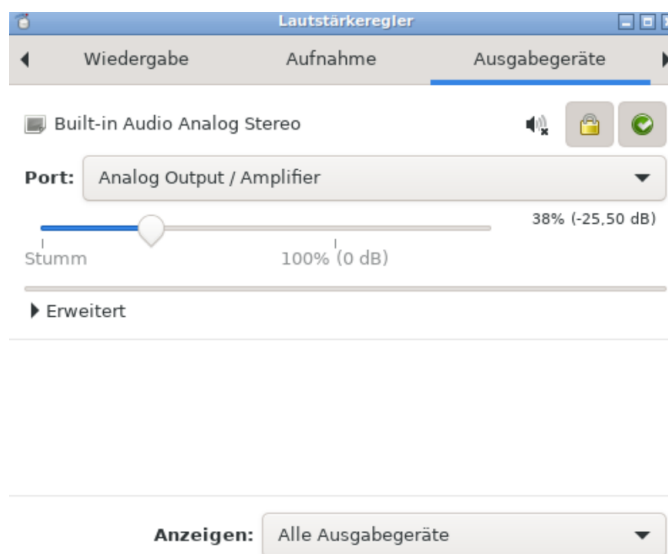
11.1 Adjusting the volume

You can adjust the volume on the client for connections where sounds are forwarded. There is a corresponding icon on the left-hand side. Click on the icon to start the dialog for adjusting the volume.

Note: In Ubuntu, pulseaudio is used as a sound server. For the Raspberry Pi, alsasound is used as the sound server.



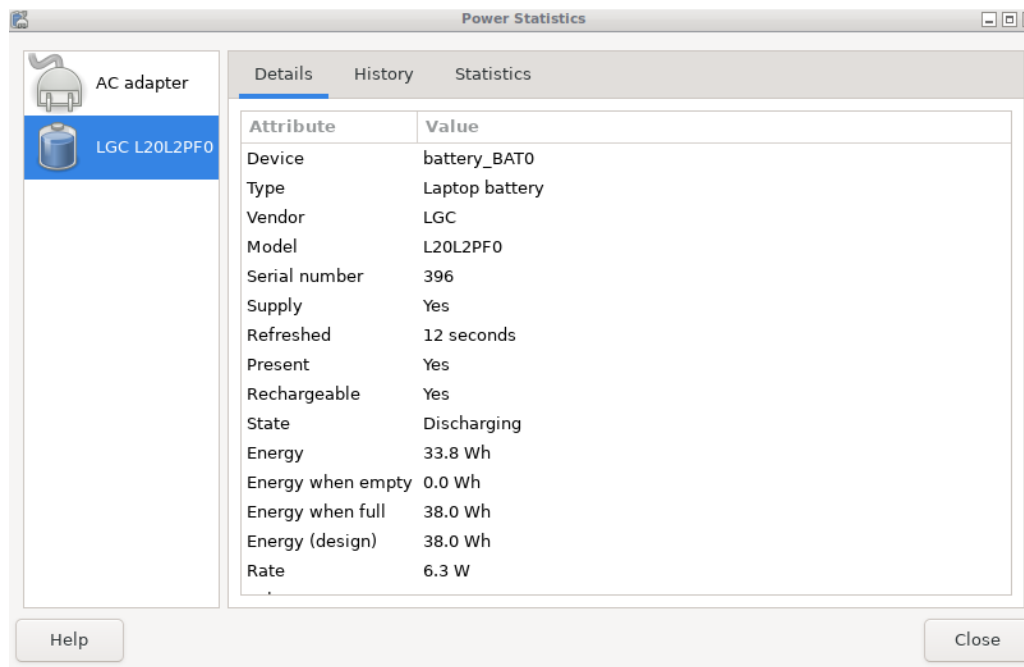
Raspberry Pi



Ubuntu

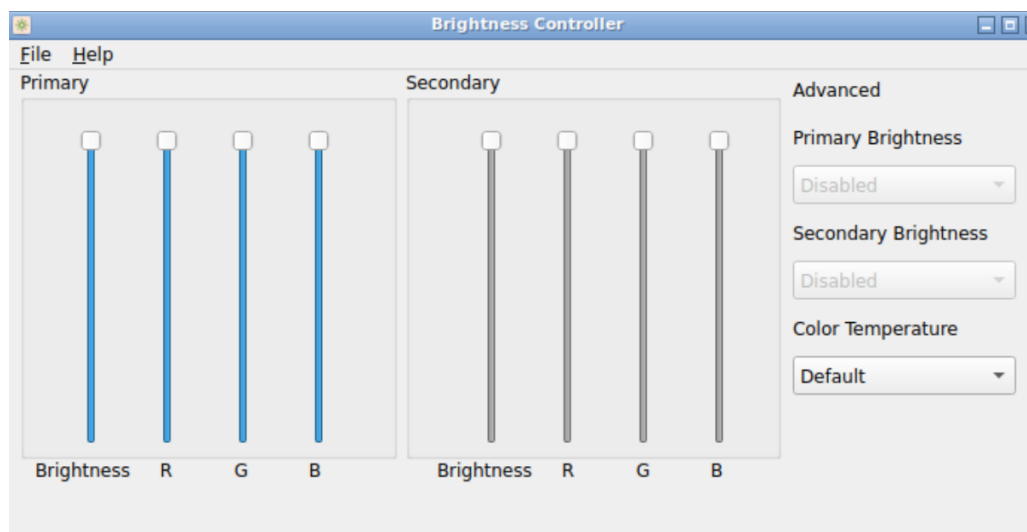
11.2 Energy display

With the Energy statistics application, you can see how much capacity the batteries have left if you are using xtc with a notebook.



11.3 Adjust brightness

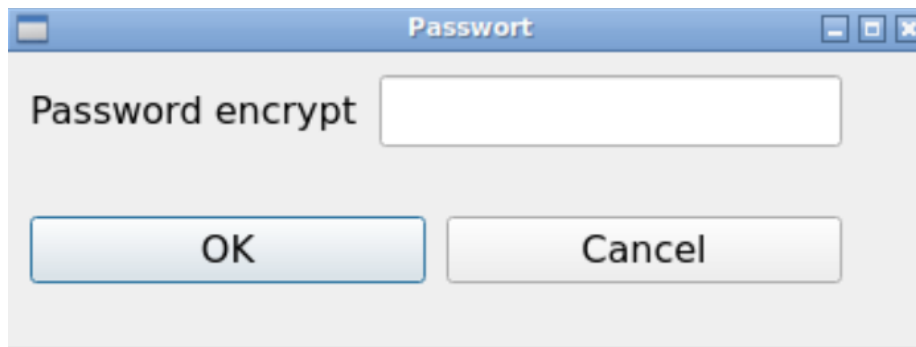
This application is only available with Ubuntu. With *Brightnesscontroller* you can adjust the brightness of the monitor.



12 Encrypt data

In the **Hardware** tab, you can specify whether data should be encrypted. The connection and VPN data is encrypted. These are all stored in the `/data` folder.

If you have ticked the **Encrypt data** box and assigned a password, you can only decrypt the data with this password. A password prompt then appears when the system is started:



The `/data` folder can only be decrypted and used again once the password has been entered.

Translated with DeepL.com (free version)

13 Configuration without GUI

It is possible to configure xtc without the "Thinclient" dialog.

The configuration via a file can be done before or after an installation.

13.1 Configuration before installation

This procedure is intended for use with a Raspberry Pi.

A configuration file and, if desired, also a file with connection parameters can be copied into the `/data/user/thinclient` folder.

After starting xtc, the data from both files are transferred to the system.

The file names for the configuration files are predefined and are called:

`thinclient.config` for the configuration files

`connection.config` for the file with the connection parameters

Note: the easiest way is to use an existing connection parameters file. The connection file is located in the `/data/user/thinclient` folder and is named `connection.conf`.

13.2 Write configuration file to /boot

Example for Ubuntu (the names of the partitions can be different):

1. `sudo losetup -Pf xhc.img`
2. `sudo fdisk -l`
Output fdisk:

Device	Boot	Start	End	Sector	Size	Typ
/dev/loop10p1		8192	532479	524288	256M	c W95 FAT32 (LBA)
/dev/loop10p2		532480	15759359	15226880	7,3G	83 Linux
/dev/loop10p3		2048	8191	6144	3M	83 Linux
3. The /data partition starts from position 2048. Mount it:
`sudo mount /dev/loop10p3 /mnt`
4. Copy the configuration file to the /mnt/thinclient folder. The file must have the name thinclient.config.
5. Adjust the file permissions of the configuration file:
`chmod a=rw /mnt/thinclient/thinclient.config`
6. Unmount partition: `sudo umount /mnt`

13.3 Configuration after installation

Create a configuration file in the /data/user/thinclient folder named thinclient-config.

Restart the system. Depending on whether xhc is in user or administrator mode, the system restarts several times. After that, the system is configured according to the defaults in the thinclient-config file.

13.4 Construction Configuration file

A configuration file consists of many parameters with values. A line consists of one parameter with one value. Between parameter and value, the "=" sign is used as the assignment operator.

Example: `system_ssh = on`. The value "on" is assigned to the "system_ssh" parameter.

13.5 Parameters and their meaning

13.5.1 System

system_name

Entering a system name (hostname).

system_vnc

Switches the VNC remote connection on or off.

Possible Values:

on: Switch on the VNC server

off: VNC server do not turn on

system_vnc_password

Password for VNC remote access. Is necessary when `system_vnc=on`.

Possible values: Any password.

system_ssh

Switch the SSH server on or off.

Possible values:

`on`: Switch on the SSH server

`off`: SSH server do not turn on

system_ssh_password

Password for SSH access. Is necessary when `system_ssh=on`.

Possible values: Any password.

system_admin

Starts xhc in administrator or user mode.

Possible values:

`on`: Start in administrator mode

`off`: Start in user mode

system_admin_password

Password for administrator mode. Necessary if `system_admin=off`

Possible values: Any password

system_language

Display language of xhc.

Possible values:

`English`: The display language is English

`Deutsch`: The display language is German

`Italiano`: The display language is Italian

system_keyboard

Specification of the keyboard layout.

Possible values: Specified by the system. example "`de`" For a DGerman keyboard, "`us`" For a American keyboard layout.

system_numerickeypad

Turn on numeric pad when xhc starts.

Possible values:

yes: Enable numeric keypad

no: Switch off numeric keypad

system_usbautomount

Automatic integration of a USB stick.

Possible values:

`on`: The UST stick is integrated automatically.

`off`: USB stick is not automatically integrated.

system_oneninedesign

Activates the software for the housing of One nine design (only for Raspberry Pi 4).

Possible values:

on: Activate software.

off: Software disable.

system_argon1

Activates the software for the enclosure Argon One (only for Raspberry Pi 4).

Possible values:

on: Activate software.

off: Software disable.

system_startminimized

Starts the dialog minimized.

Possible values:

yes: Start dialog minimized.

no: Do not start dialog minimized.

system_soundcard

Selection of the Sound card.

Possible values:

The first character of the output medium must be specified. See the corresponding selection list in the dialog.

13.5.2 Network

system_networksave

Indicates whether network settings are saved.

Possible Values:

yes: Save network settings.

no: Do not save network settings.

network_typ

Specification of the network configuration.

Possible values:

dhcp: The IP address is assigned by a DHCP server.

static: The IP address is entered in the system.

network_interface

Specification of the network interface to be used.

Possible values:

Name of the network card. As specified by the system.

network_address

Specification of the system's IP address. Only makes sense if network_typ=static.

Example: 192.168.0.20

network_subnetmask

Specification of the system's subnet mask. Only makes sense if `network_typ=static`.

Example: 255.255.255.0

network_gateway

Specification of the IP address of the gateway. Only makes sense if `network_typ=static`.

Example: 192.168.0.10

network_dns

Specification of the IP address of the DNS server. Only makes sense if `network_typ=static`.

Example: 8.8.8.8

network_wlan_ssid

Specification of the SSID of the WLAN to be used.

network_wlan_password

Specification of the password for the SSID.

13.5.3 Monitor

monitor_screensaver

Turns the screen saver on or off.

Possible values:

`on`: Activate the screen saver.

`off`: Switch off the screen saver.

monitor_standby

power saving mode turn the monitor on or off.

Possible values:

`on`: Switch on energy saving mode.

`off`: Switch off energy saving mode.

monitor_resolution

Specification of the screen resolution.

Possible values:

`automobile`: Automatic determination of the screen resolution.

The other values result from the possibilities of the monitor. Example: 1024x768

monitor_resolution2

Specification of the screen resolution for the second monitor.

Possible values:

`automobile`: Automatic determination of the screen resolution.

The other values result from the possibilities of the monitor. Example: 1024x768

monitor_orientation

Logical position of the first monitor.

Possible values:

`left`: Monitor left

`right`: Monitor right

above: Monitor above

below: Monitor below

monitor_optimizegraphic

If there are problems with the graphics display, this option should be switched on. This means that the driver "vc4-fkms-v3d" for the graphics card is not loaded. However, dual monitor operation is no longer possible with this.

Possible values:

yes: Do not load driver

no: load driver

13.5.4 VPN

vpn_program

VPN program to use.

Possible values: wireguard or openvpn.

vpn_configfile

Name of the parameter file from Open VPN or WireGuard. The file path must also be specified:
/data/user/vpn

vpn_runfile

Name of the script to execute OpenVPN or WireGuard. The file name is fixed:
/data/user/vpn/vpn.sh

vpn_parameter

Additional parameters for openvpn. See documentation for the openvpn server.

vpn_autostart

Connect VPN automatically after system start.

Possible values:

yes: Connect automatically

no: Don't connect automatically

vpn_systemlogin

Show login dialog when VPN is started.

Possible values:

yes: Show login dialog

no: Do not show the login dialog

vpn_otp

Prompt for one-time password in login dialog when VPN is started.

Possible values:

yes: Prompt for one-time password

no: Do not query one-time password

13.5.5 Date/Time

time_set

Change the date and time in the system.

Possible values:

yes: Change the date and time

no: Do not change the date and time

time_show

Show the date and time in the panel.

Possible values:

yes: Show the date and time

no: Do not show the date and time

time_time

Date and time to be set after the system start.

Possible values: Date and time in the format: day-month-year hour: minute

Example: 2020-12-28 14: 30

time_automatic

Set date and time automatically. Only makes sense if **time_set=yes**.

Possible values:

yes: Set date and time automatically.

no: Do not set the date and time automatically.

time_ntp

Specification of a time server. Example:0.pool.ntp.org. Only makes sense if **time_set=yes**.

time_execute

Take action.

Possible values:

yes: Take action

no: Take no action

time_repeat

Repeat action.

Possible values:

yes: Action is repeated

no: Action is only carried out once

time_action

Action to be carried out.

Possible values:

shutdown: Shut down the system

reboot: Restart the system

time_at

Date and time when the action should be carried out.

Possible values:

Date and Time:in year-month-day hour: minute format. Example: 2020-12-31 17:30

Specification ZeitPoint: in the format: + hour: minute. Example. +03: 15. Meant: Action will be taken 3 hours and 15 minutes after the system starts.

13.5.6 Security

security_simplemenu

Use simple context menu or default context menu.

Possible values:

yes: Simple context menu.

no: Standard context menu.

security_virtualconsole

Allow virtual consoles.

Possible values:

yes: Virtual consoles allowed.

no: No virtual consoles.

security_root_password

Enter a password for the "root" user.

security_user_password

Enter a password for the "thinclient" user.

13.6 Example

Here is an example of a configuration file:

```
system_networksave=yes
network_typ=static
network_interface=eth0
network_address=192.168.7.28
network_subnetmask=255.255.0.0
system_vnc=on
system_vnc_password=thinclient
system_ssh=on
system_ssh_password=thinclient
system_language=German
system_keyboard=de
monitor_screensaver=yes
monitor_standby=yes
```

This example configures the eth0 network card with the IP address 192.168.7.29 and the subnet mask 255.255.0.0. The VNC server and the SSH server for remote administration are switched on, the password for both is "thinclient".

The display language is "German". The keyboard layout is for a German keyboard.

The screen saver and energy saving mode are switched on.

14 Others

14.1 Context menu

The mouse has a context menu (click with the right mouse button).

The context menu has these menu items:

terminal emulator: Selecting this menu item starts a terminal.

Restart xhc: If the "Thinclient" dialog no longer reacts, it can be restarted by selecting this menu item.

Exit: By selecting this menu item, the graphical user interface (openbox) can be closed. Then the console of the Systems displayed.

Note: If the "Simple context menu" switch in the "Security" tab is enabled, there is only the **Restart txt** menu item.

14.2 Raspberry Pi: Exchange Pi 4 for Pi 5

You are using xhc in a Raspberry Pi 5 and want to use the SD card in a Raspberry Pi 4 (or vice versa). To do this, xhc must be run in administrator mode. If xhc is run in user mode and you replace the Raspberry Pi 5 with a Raspberry Pi 4 (or vice versa) the system will not start. You will get an error message.

The reason is the ramdisk which is needed for the overlay file system. This must be adapted to the system. This is only possible in administrator mode (i.e. without Overlay File System).

14.3 Test Webcam

You have connected a webcam and want to know if it works:

1. Open a terminal. To do this, select "Terminal emulator" in the context menu or click the "Terminal" button in the "Settings" tab.
2. Type in the terminal: `guvcview`
3. Press the <return> key
4. The application will start and should display a camera image.

14.4 Data backup

Connection data, settings and VPN data are all located in the `/data` folder.

15 Installation for experts

The following sections explain how to prepare a memory card, install the operating system and then xrc. This procedure is only necessary if you want to make your own changes to the system. All the commands listed are described for a Linux system.

15.1 Copy the operating system to the SD card

To create the operating system and data partition use the script `createsd.sh`.

The script is located in the `xrcbin.tar.gz` file in the `xrc` folder.

Start the script in a terminal with these parameters:

```
sudo xrc/createsd.sh <SD device name> <image Raspberry OS>.
```

<SD device name> is the device name of the SD card is, e.g. `/dev/sb`

<Image Raspberry OS> is the name of the ISO file containing the image of Raspberry OS.

This script is used to copy the operating system to the SD card and creates another partition.

15.2 Raspberry OS configure

Start the Raspberry Pi with the SD card.

Login as user "pi":

Log in: pi

Password: raspberry

15.3 Optional: Set the password for "root"

Inputbut: `sudo passwd`

After that wishsright password enter.

Optional: set the German keyboard

Input: `sudo raspi-config`

Select in the application menu:

4 Localization Options

I3 Change Keyboard Layout

Select keyboard layout "German".

Restart Raspberry Pi: `sudo reboot`

16 xrc on Raspberry Pi 4 or Pi 5 to install

It becomes the file `xrcbin.tar.gz` needed.

1. file `xrcam.tar.gz` copy it to the Raspberry Pi.
2. Extract file: `tar xvfzp xrcam.tar.gz`
3. installation as root start: `sudo sh xrc/install.sh`

Attention: Internet access is required for installation.

After the installation, the Raspberry Pi must be restarted.

16.1 Installation details

- During installation various packages are installed.
- The graphical user interface with "openbox" is installed as the desktop.
- The users "thinclient" and "thinclientssh" created.
- The preset User "pi" is removed.
- An ssh server will be installed.
- A VNC server will be installed.
- The file `/etc/sudoers` becomes "thinclient" for the user to different scripts expanded.
- The user "thinclient" is configured as an autologin.
- It will be the files `/etc/init.d/thinclient_start` and `/etc/init.d/thinclient_shutdown` Installed. These scripts configure xrc.
- The file `.bashrc` in the folder `/home/thinclient` is supplemented by the start of the graphical user interface.
- The Partition `/` and `/boot` are changed to "read only".
- The folders `/tmp` and `/home` are configured as a temporary file system.
- On the folder `/data` can also be accessed by writing.
- The application for the thin client can be found in the folders:
 - `/opt/thinclient/bin`: application to configure the connections.
 - `/opt/thinclient/scripts`: Scripts
 - `/opt/thinclient/config`: System parameter
 - `/var/thinclient/home`: Home directory of the user thinclient
 - `/data/user/thinclient`: Configuration files
- File with connection parameters: `/data/user/thinclient/connection.conf`

17 Details about xhc

17.1 General

- xhc is based on the Raspberry OS Light operating system (Debian without graphical user interface) or Ubuntu Server.
- In order to easily configure clients (VNC, RDP, etc.), the graphical user interface "openbox" is used.
- After starting the Raspberry Pi, there is an automatic login as a "thinclient" user. This starts the graphical user interface and the "thinclient" application. The connections are configured with the "thinclient" application.
- To establish a connection to a server, the "thinclient" application calls external applications (client applications such as vncviewer, xfreerdp, x2go) using a system command.
- The file system is only integrated for reading. To enable necessary write access, the folders /tmp and /home are configured as temporary file systems. This means that after a restart the contents of these folders will be lost. The folder /data can be the only one Folder in File system.
- Passwords are stored encrypted according to SHA-256.

17.2 Sourcecode

Xhc is written in Python. The source code can be found in the file `xtcbin.tar.gz`. You can download this file from

<https://www.vmfreen.org/xtc>

("Download for Ubuntu Server") or click here:

<https://www.vmfreen.org/xtc/downloads/xtcbin.tar.gz>

Unzip the file. The source code is located in the `bin` folder. The source code is located in the `bin` folder. The bash scripts are located in the `script` folder.

17.3 Preset passwords

<i>user</i>	<i>password</i>
root	root
thinclient	thinclient

17.4 External access with ssh

The Raspberry Pi can be accessed with ssh. As a user becomes `thinclientssh` used.

To do this, ssh must be activated in the "System" tab and a password assigned to the user.

17.5 Changes to the file system

Make the file system writable:

```
sudo mount -o remount, rw/  
sudo mount -o remount, rw /boot  
sudo mount -o remount, rw /boot/firmware
```

Need changes in the folders `/tmp` or `/home` must be carried out, the file `/etc/fstab` changed so that these folders are not a temporary file system:

Change of:

```
tmpfs      /tmp          tmpfs nodev, nosuid 0 0
tmpfs      /home/thinclient tmpfs nodev, nosuid 0 0
```

after:

```
#tmpfs     /tmp          tmpfs nodev, nosuid 0 0
#tmpfs     /home/thinclient tmpfs nodev, nosuid 0 0
```

The system must then be restarted: `reboot`

17.6 Changes in `/home/thinclient`

The file system must be made writable (see section "Changes in the file system").

The changes in the home directory of the user "thinclient" must be in the folder

`/var/thinclient/home/thinclient`

be performed. The contents of this folder will be in the folder when the system starts

`/home/thinclient` copied there `/home` a temporary file system and this is empty at system start.

18 Error messages

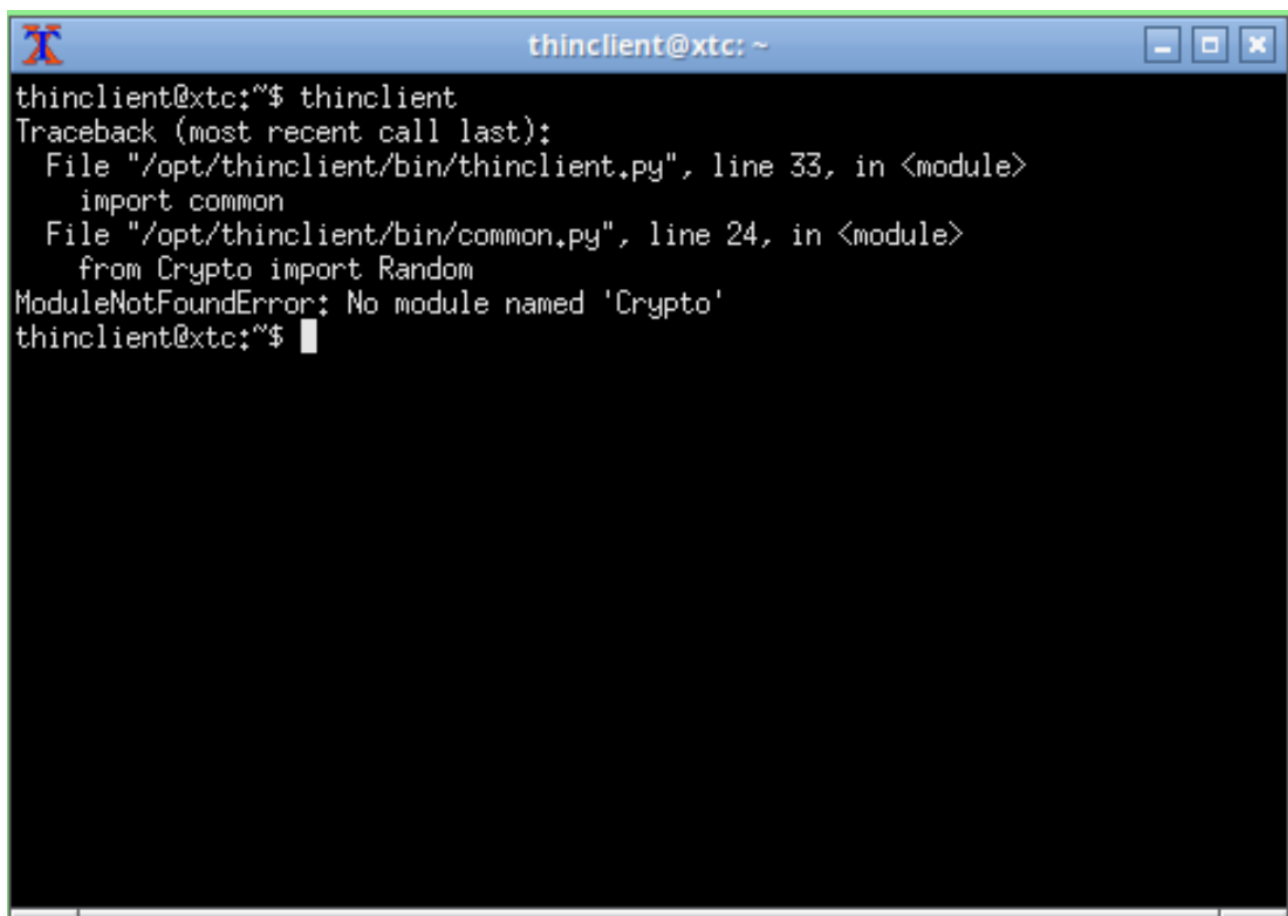
Not all errors are recognized during the tests before a new version is released. You can help with troubleshooting and contribute to making xhc a better product.

Problem: You start the system and the "Thinclient" dialog does not appear, you only see a green screen.

Reason: xhc does not start because there is an error. This can be a program error or also that xhc cannot determine the system environment.

To see the error, proceed as follows:

1. Click the right mouse button
2. Select "Terminal emulator" from the context menu
3. A terminal window then appears on the screen
4. Enter: `thinclient`
5. Press the <return> key (use the `thinclient` command to start xhc)
6. An error message should now be displayed in the terminal
7. Send this error message to: info@vmfree.org

A terminal window titled 'thinclient@xhc: ~' with standard window controls. The terminal shows a command prompt where the user has entered 'thinclient'. This has triggered a Python traceback. The traceback indicates the error occurred in '/opt/thinclient/bin/thinclient.py' at line 33, where it tried to import a module named 'common'. This module, in turn, tried to import 'Random' from a module named 'Crypto' in '/opt/thinclient/bin/common.py' at line 24. The final error is a 'ModuleNotFoundError: No module named 'Crypto''. The prompt returns to 'thinclient@xhc:~\$' with a cursor.

```
thinclient@xhc:~$ thinclient
Traceback (most recent call last):
  File "/opt/thinclient/bin/thinclient.py", line 33, in <module>
    import common
  File "/opt/thinclient/bin/common.py", line 24, in <module>
    from Crypto import Random
ModuleNotFoundError: No module named 'Crypto'
thinclient@xhc:~$
```

Terminal with error message