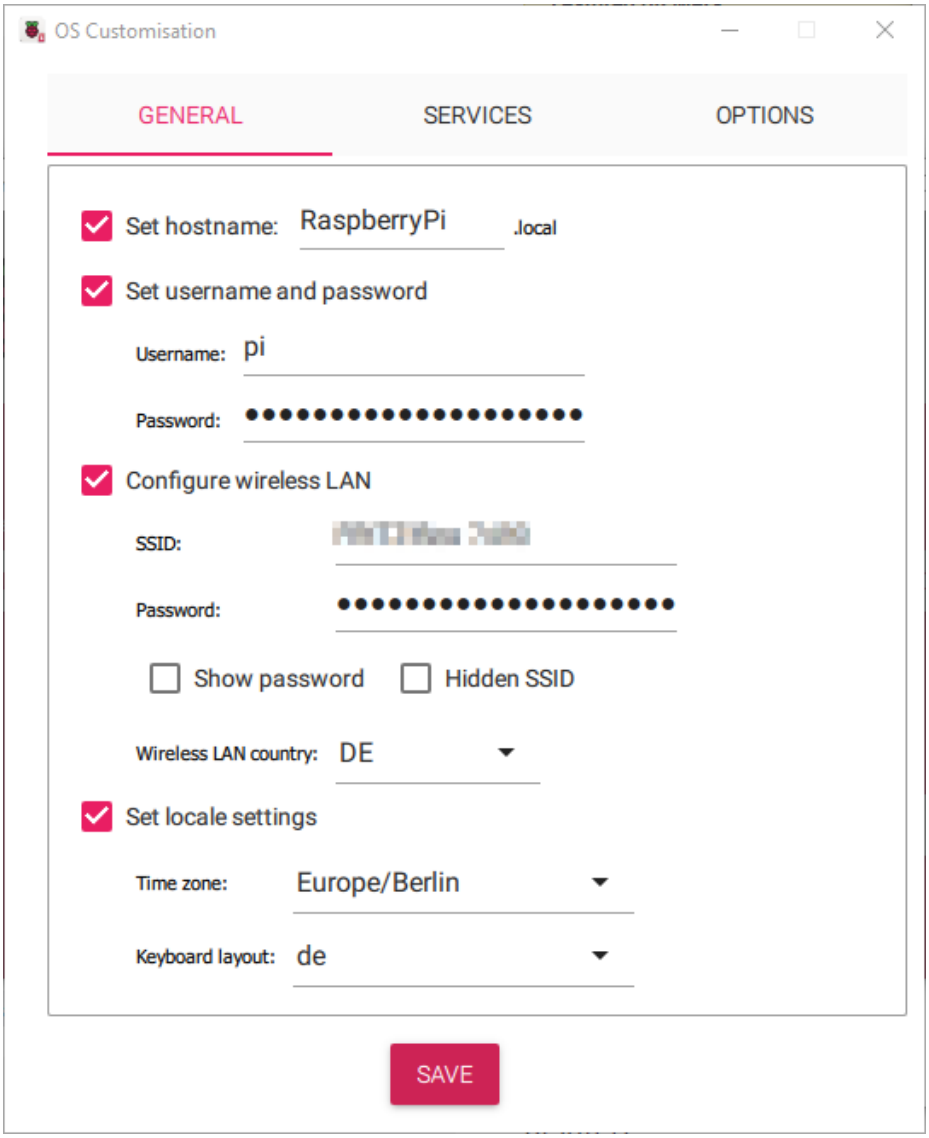
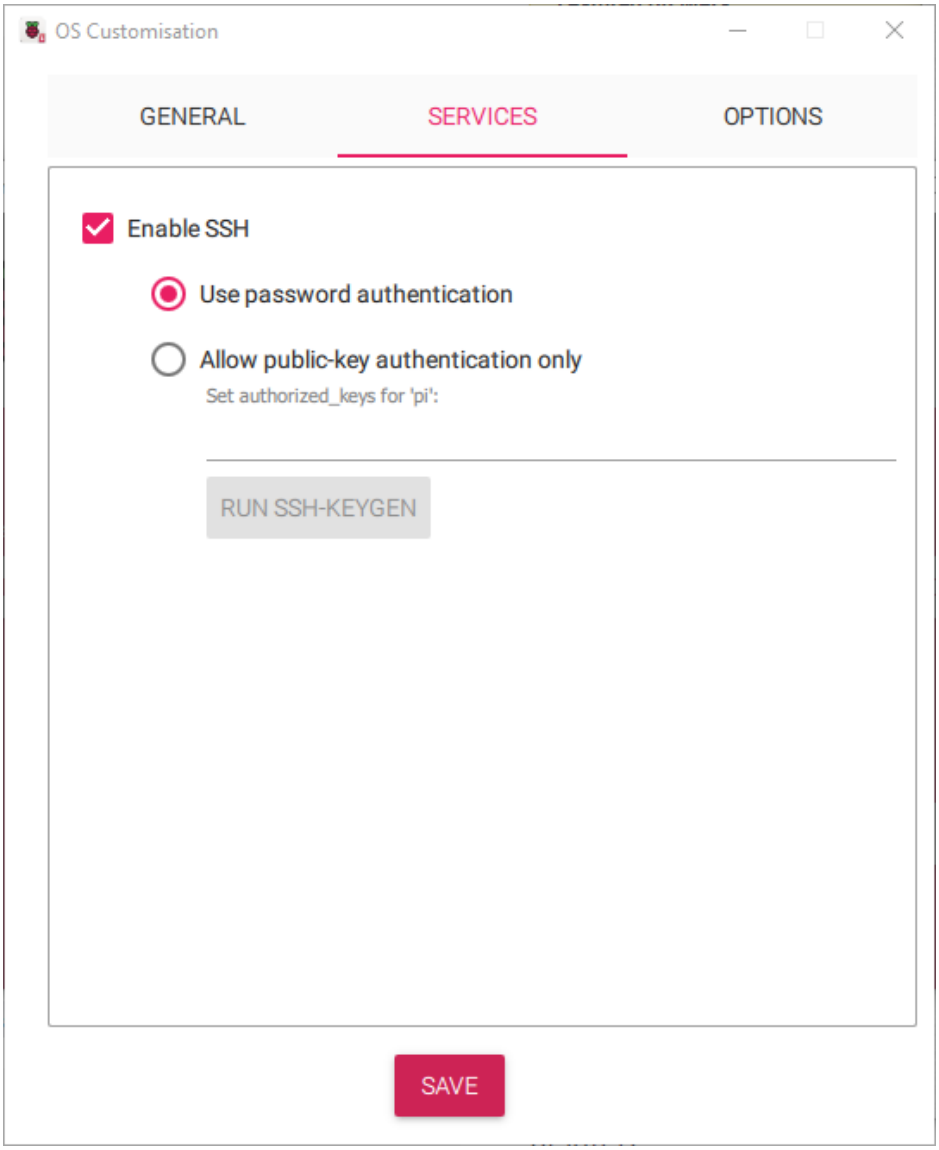
Pi-Ager install on Raspberry Pi 3/Pi 4/Pi zero (2)w under Pi OS 12 Lite bookworm

- For all Pi:
  Download and install Raspberry Pi Imager v1.8.4 or later.
  Start Raspberry Pi Imager, then select:
  Raspberry Pi Device:
  NO FILTERING
  Operating System:
  Raspberry Pi OS Lite (32-bit) (A port of Debian Bookworm with no desktop environment)
  Storage:
  Use an USB Reader and choose your SD-Card, min. 8 GB
  Then click 'NEXT'
  In popup Window 'Use OS customisation' select 'EDIT SETTINGS'.
  In the 'GENERAL' Tab edit your settings:



In the ‘SERVICES’ Tab enable SSH:



Then ‘SAVE’ and apply OS customisation settings with ‘YES’.
The customized OS is now written to your SD-Card.
Put your SD-Card in your Raspberry Pi and power on your Pi device.
Login via SSH (e.g. use PuTTY) or connect a HDMI monitor and USB keyboard to your Raspberry device and continue with the setup as described below.

- To allow root login:
  In /etc/ssh/sshd_config : remove # from PermitRootLogin and replace prohibit-password to yes. Then restart ssh server: sudo service ssh restart
  Set your root password with: sudo passwd root

- Run raspi-config and disable login shell on serial port and enable serial port

- Edit config.txt in /boot/firmware to support I2C and SPI devices:

  CAUTION: If you want to edit config.txt ,cmdline.txt and setup.txt under Windows in a Terminal Window, e.g. using Terminal Apps like PuTTY, the Linux folder /boot/firmware on

the SD-Card is mapped to a windows partition FAT32 USB Drive named bootfs and contains the above mentioned files.

```
# Additional overlays and parameters are documented /boot/overlays/README
# Use Pi-Ager Pins 11/13 GPIO 17/27 for I2C
dtoverlay=i2c-gpio,bus=3,i2c_gpio_sda=17,i2c_gpio_scl=27
# Use Pi-Ager Pin 16 for MCP3204
dtoverlay=spi1-1cs,cs0_pin=16
```

at the end of config.txt add the following lines to support bluetooth and Nextion TFT displays via serial port /dev/serial0 :

```
[all]
enable_uart=1
dtoverlay=miniuart-bt
#  force_turbo=1
```

- Add in /boot/firmware/cmdline.txt at the end of line this to enable USB camera with fswebcam :
  dwc_otg.fiq_fsm_mask=0x3

- Reboot system

- Edit /etc/modules to load i2c-dev at boot, add this line :
  i2c-dev

- Add file :
  sudo touch /etc/modprobe.d/raspi-blacklist.conf

- Install git: sudo apt install git

- Get a copy from Pi-Ager repository to your local system:
  git clone –depth=1 –b master https://github.com/Tronje-the-Falconer/Pi-Ager
  All project file are now in the folder ./Pi-Ager/
  Change working directory to Pi-Ager
  cd Pi-Ager

- Copy setup.txt from local repository to /boot/ and edit it as needed:
  sudo cp ./boot/setup.txt /boot/firmware/
  Create a symbolic link in /boot to /boot/firmware/setup.txt
  cd /boot
  sudo ln –s /boot/firmware/setup.txt setup.txt

- Copy /etc/modprobe.d/Pi-Ager_i2c_off.conf.on from local repository to /etc/modprobe.d/
  sudo cp ./etc/modprobe.d/Pi-Ager_i2c_off.conf.on /etc/modprobe.d/

- Reboot system

- Update system:
  sudo apt-get update
  sudo apt-get upgrade

- Install php 8:
  sudo apt install php-fpm php-cli
  sudo apt install php
  sudo apt install php-common php-sqlite3

- Install additional modules for php:
  sudo apt install php-mbstring php-zip php-curl

- Install lighttpd:
  sudo apt-get install lighttpd
  sudo systemctl status lighttpd

  sudo nano /etc/lighttpd/lighttpd.conf
  and change/add Parameter

  server.document-root = "/var/www/html"
  to
  server.document-root = "/var/www"
  add “mod_auth” to server.modules list
  add “mod_authn_file” to server.modules list
  Save and close nano

  To enable PHP8 in Lighttpd, we must modify `/etc/php/8.2/fpm/php.ini` and uncomment the line `cgi.fix pathinfo=1`. In my `php.ini` file, I found it on line `807`. To uncomment, just remove the semicolon in the beginning.

  sudo usermod -G www-data -a pi
  sudo chown -R www-data:www-data /var/www
  sudo chmod -R 755 /var/www

- Reboot system

  For testing the web server, generate html-page:

  sudo nano /var/www/test.html
  with content:

```
<html>
<head><title>Test-Seite</title></head>
<body>
<h1>Das ist eine Test-Seite.</h1>
</body>
</html>
```

  Change owner: sudo chown www-data:www-data /var/www/test.html

  Enter your IP Address into the browser followed by /test.html

  In addition we need .htcredentials to contain user and password.

  For that we use the Online-Tool https://websistent.com/tools/htdigest-generator-tool/

  Username: pi-ager

REALM: Pi-Ager
Password: raspberry
Caution! All entries are case sensitive!

Open this file now

```
sudo nano /var/.htcredentials
```

and fill in the string output from the generator tool.

Save file with “STRG+o”, “RETURN” and close with “STRG+x”

Now we have to setup the password authentification in lighttpd:

```
sudo nano /etc/lighttpd/conf-available/05-auth.conf
```

The following lines are added under server.modules += („mod_auth“) :

```
auth.backend                = "htdigest"
auth.backend.htdigest.userfile     = "/var/.htcredentials"

auth.require                = ( "/settings.php" =>
                            (
                             "method" => "digest",
                             "realm" => "Pi-Ager",
                             "require" => "user=pi-ager"
                            ),
                             "/admin.php" =>
                            (
                             "method"  => "digest",
                             "realm"   => "Pi-Ager",
                             "require" => "valid-user"
                             ),
                             "/webcam.php" =>
                            (
                             "method"  => "digest",
                             "realm"   => "Pi-Ager",
                             "require" => "valid-user"
                             ),
                             "/notification.php" =>
                            (
                             "method"  => "digest",
                             "realm"   => "Pi-Ager",
                             "require" => "valid-user"
                             )
                            )
```

Then we activate this modul:

```
sudo lighty-enable-mod auth
```

In addition we have to edit :

```
sudo nano /etc/lighttpd/conf-available/15-fastcgi-php-fpm.conf
```

Add “broken-scriptfilename” and “x-sendfile” :

```
fastcgi.server += ( ".php" =>
        ((
                "socket" => "/run/php/php-fpm.sock",
                "broken-scriptfilename" => "enable",
                "x-sendfile" => "enable"
        ))
)
```

save and close nano

Now enable these modules:
sudo lighty-enable-mod fastcgi-php-fpm

Now reload the the webserver:
sudo service lighttpd force-reload

Now continue to install additional modules:

- Install smbus
  sudo apt-get install python3-smbus

- Install sqlite3:
  sudo apt install sqlite3

- Install pip3
  sudo apt install python3-pip

  CAUTION : sudo pip3 install <module> no longer supported.
  If you see an error message, try to install the module with
  sudo apt install python3-<module name>. If this does not work, try install modules with
  sudo pip3 install <module name> –break-system-packages

```
error: externally-managed-environment
× This environment is externally managed
╰─> To install Python packages system-wide, try apt install
    python3-xyz, where xyz is the package you are trying to
    install.

    If you wish to install a non-Debian-packaged Python package,
    create a virtual environment using python3 -m venv path/to/venv.
    Then use path/to/venv/bin/python and path/to/venv/bin/pip. Make
    sure you have python3-full installed.

    If you wish to install a non-Debian packaged Python application,
    it may be easiest to use pipx install xyz, which will manage a
    virtual environment for you. Make sure you have pipx installed.

    See /usr/share/doc/python3.11/README.venv for more information.
note: If you believe this is a mistake, please contact your Python
installation or OS distribution provider. You can override this, at the
```

```
risk of breaking your Python installation or OS, by passing --break-system-
packages.
hint: See PEP 668 for the detailed specification.
```

- Install DHT sensor support
  sudo pip3 install Adafruit-DHT

- Install SHT1x sensors
  sudo pip3 install pi-sht1x

- Install libgd-dev (needed for new version of fswebcam)
  sudo apt install libgd-dev

- Install openssl dev package
  sudo apt install libssl-dev

- Install fswebcam:
  sudo apt install fswebcam

- Install cryptography
  sudo apt install python3-cryptography

- Install uuidgen
  sudo apt install uuid-runtime

- Install wiringpi new version with Pi4 support :
  cd /tmp
  wget https://project-downloads.drogon.net/wiringpi-latest.deb
  sudo dpkg -i wiringpi-latest.deb

- Copy gpio to /usr/local/bin
  sudo cp /usr/bin/gpio /usr/local/bin
  sudo chmod 4755 /usr/local/bin/gpio

- Install PiShrink (not longer needed)
  wget https://raw.githubusercontent.com/Drewsif/PiShrink/master/pishrink.sh
  chmod +x pishrink.sh
  sudo mv pishrink.sh /usr/local/bin

- Nextion serial client (HMI Dislplay support)
  sudo pip3 install nextion

- Install lsof command:
  sudo apt update
  sudo apt install lsof

- Install Locale en-GB and de-DE UTF-8 using
  sudo raspi-config

- Enable Serial Interface, disable login, needed for HMI Nextion Display

sudo raspi-config

- Install zip and unzip:
  sudo apt install zip unzip

- Install schedule
  sudo pip3 install schedule

- Install MQTT client
  sudo apt install python3-paho-mqtt

- Workaround for Adafruit_DHT for Pi4:
  In "/usr/local/lib/python3.11/dist-packages/Adafruit_DHT/platform_detect.py", you can add/modify some lines, so it should workaround the issue, that GPIO Control does not work.

```python

def pi_version():
    """Detect the version of the Raspberry Pi.  Returns either 1, 2, 3, 4, 5 or
    None depending on if it's a Raspberry Pi 1 (model A, B, A+, B+),
    Raspberry Pi 2 (model B+), Raspberry Pi 3,Raspberry Pi 3 (model B+), Raspberry Pi 4,
    Raspberry Pi 5 or not a Raspberry Pi.
    """
    # Check /proc/cpuinfo for the Hardware field value.
    # 2708 is pi 1
    # 2709 is pi 2
    # 2835 is pi 3
    # 2837 is pi 3b+
    # 2711 is pi 4
    # 2712 is pi 5
    # Anything else is not a pi.
    with open('/proc/cpuinfo', 'r') as infile:
        cpuinfo = infile.read()
    # Match a line like 'Hardware   : BCM2709'
    match = re.search('^Hardware\s+:\s+(\w+)$', cpuinfo,
                      flags=re.MULTILINE | re.IGNORECASE)
    if not match:
        # Couldn't find the hardware, assume it isn't a pi.
        return None
    if match.group(1) == 'BCM2708':
        # Pi 1
        return 1
    elif match.group(1) == 'BCM2709':
        # Pi 2
        return 2
    elif match.group(1) == 'BCM2835':
        # Pi 3
        return 3
    elif match.group(1) == 'BCM2837':
        # Pi 3b+
        return 3
    elif match.group(1) == 'BCM2711':
        # Pi 4  works same as 3b+
        return 3
    elif match.group(1) == 'BCM2712':
        # Pi 5 not working
        return 5
    else:
        # Something else, not a pi.
        return None
```

- Unblock wifi for Pi4, add rfkill unblock wifi and disable power management for wlan0:
  cd /etc

sudo nano rc.local

```
pi@pi-ager: ~
  GNU nano 7.2                    /etc/rc.local
#!/bin/sh -e
#
# rc.local
#
# This script is executed at the end of each multiuser runlevel.
# value on error.
#
# In order to enable or disable this script just change the execution
# bits.
#
# By default this script does nothing.

# Print the IP address
_IP=$(hostname -I) || true
if [ "$_IP" ]; then
  printf "My IP address is %s\n" "$_IP"
fi
# start pi-ager
systemctl start pi-ager_main.service

# disable power management for wlan0 to increase WLAN reliability
rfkill unblock wifi
sleep 1
# iwconfig wlan0 power off
iw wlan0 set power_save off

# enable AP-STA mode
iw dev wlan0 interface add wlan1 type __ap
sleep 1

iw wlan1 set power_save off

# enable captive portal
nodogsplash

exit 0

                          [ 36 Zeilen gelesen ]
^G Hilfe     ^O Speichern ^W Wo ist    ^K Ausschneid^T Ausführen ^C Position
^X Beenden   ^R Datei öffn^\ Ersetzen  ^U Einfügen  ^J Ausrichten^/ Zu Zeile
```

- Only if wanted: Generate/edit crontab to prepare for automatic enable pi-ager_backup.sh

```
pi@pi-ager:~ $ sudo crontab -l
#---------------------------------------------------------------------
# Shell variable for cron
SHELL=/bin/bash
# PATH variable for cron
PATH=/usr/local/bin:/usr/local/sbin:/sbin:/usr/sbin:/bin:/usr/bin:/usr/bin/X11
#M   S     T M W   Befehl
#---------------------------------------------------------------------
#*    */6   * * *   /usr/bin/flock -w 0 /var/run/pi-ager_backup.pid /usr/local/bin/pi-ager_backup.sh >> /var/log/pi-ager_backup
.log 2>&1
#*/2 *     * * *   logger "greetings from the crontab" > /dev/null 2>&1
```

- Use visudo to edit /etc/sudoers, so that the www-data User (User of Website) can execute /var/sudowebscript.sh :
  sudo visudo
  and then in sudoers following
  ...
  #User privilege specification
  root ALL=(ALL:ALL) ALL
  ...
  adding:

  www-data ALL=NOPASSWD:/var/sudowebscript.sh, /var/show_wifi_connections.sh, /var/updatessid.sh,/usr/bin/raspi-config,/usr/bin/nmcli

Save and exit.

- Install access point with network manager:
  Copy from repository /usr/local/bin/setup_pi-ager-ap.sh to destination.
  Create virtual interface wlan1:
  sudo iw dev wlan0 interface add wlan1 type __ap
  then run script :
  cd /usr/local/bin
  sudo ./setup_pi-ager-ap.sh

- Install nodogsplash captive portal
  sudo apt install iptables
  sudo apt install libmicrohttpd-dev
  cd ~
  git clone https://github.com/nodogsplash/nodogsplash.git
  cd ./nodogsplash
  make
  sudo make install
  copy all from repository /etc/nodogsplash to /etc/nodogsplash
  sudo chmod +x /usr/bin/nodogsplash
  sudo chmod +x /usr/bin/ndsctl

- Install Bluetooth modules to support Bluetooth Temp./Hum Sensor from Xiaomi
- sudo apt install libglib2.0-dev
- sudo pip3 install bluepy requests
- sudo apt install bluetooth libbluetooth-dev
- # sudo pip3 install pybluez pycryptodomex
- Patch btle.py to stop intermittend errors:
  File : /usr/local/lib/python3.11/dist-packages/bluepy/btle.py :

```
    def _stopHelper(self):
        if self._helper is not None:
            DBG("Stopping ", helperExe)
            self._poller.unregister(self._helper.stdout)
            self._helper.stdin.write("quit\n")
            self._helper.stdin.flush()
            self._helper.wait()
            time.sleep(0.1)     # patch to avaid failed to execute managment command 'scanned' (code: 11, error: Rejected)
            self._helper = None
        if self._stderr is not None:
            self._stderr.close()
            self._stderr = None
```

- Now copy all files and folders from your local git repository /var/www to /var/www/
- from local repository /opt/pi-ager/ to /opt/pi-ager/

- from local repository /var/sudowebscript.sh to /var/
- sudo chown –R www-data:www-data /var/www
- sudo usermod –G gpio –a www-data
- sudo chmod 666 /var/www/logs/logfile.txt
- sudo chmod 755 /var/www/logs/
- sudo chmod 664 /var/www/config/pi-ager.sqlite3
- sudo chown -R www-data:www-data /var/www/config/
- sudo chmod 777 /var/www/config/
- sudo chmod 555 /var/sudowebscript.sh /var/updatessid.sh /var/show_wifi_connections.sh
- from local repository /usr/local/bin/*.sh copy all to /usr/local/bin/
  (pi-ager_backup.sh, pi-ager_image.sh,setup_pi-ager.sh)
  Set +x mode to the scripts :
  sudo chmod +x /usr/local/bin/*.sh

- from local repository /lib/systemd/system copy the following files to
  /lib/systemd/system/ :
  pi-ager_main.service
  setup_pi-ager.service
  Then activate these services:
  sudo systemctl daemon-reload

- from local repository /usr/bin copy the following file to /usr/bin/. This is a newer version of fswebcam with re-get frame on error.
  fswebcam
  Set +x mode to fswebcam:
  sudo chmod +x /usr/bin/fswebcam

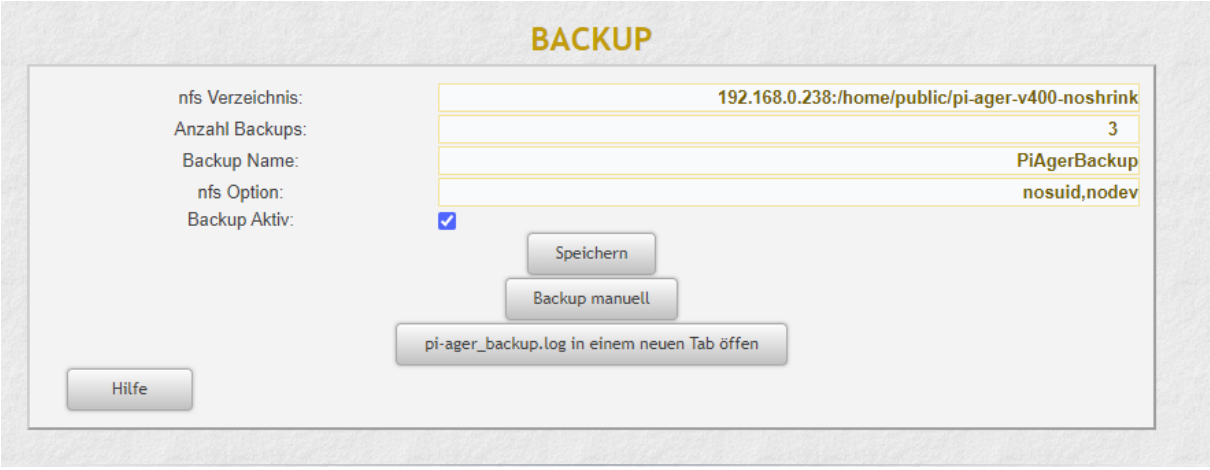
- from local repository /usr/share/man/man1/fswebcam.1.gz copy the following file to /usr/share/man/man1/
  fswebcam.1.gz

- Restart system
  sudo reboot

How to generate and deploy Pi-Ager Images

There are some steps to do for generating and deploying a new image from a running Pi-Ager system:

1. Setup a NFS Server to store a new image. The best way is using a Raspi 4B or 5 equipped with an USB Memory stick with 128GB or more. Using RPi 5 it is now possible to add a NVME SSD so that there will be enough space for storing one or more images.
2. On the NFS Server System Install Pi Power Tools using the well-known Pi-Apps.
3. On the Pi-Ager setup and start an Image backup on the ADMIN page. For example :



4. Next start a terminal on the Pi-Agerand start the pi-ager_image.sh script with option -l:

```
pi@pi-ager: /usr/local/bin

pi@pi-ager:~ $ cd /usr/local/bin/
pi@pi-ager:/usr/local/bin $ sudo pi-ager_image.sh -l
Backup ist inaktiv. Pi-Ager_image wird gestartet!
überprüfe ob der NFS-Server vorhanden ist.
Checking...
192.168.0.238:/home/public/pi-ager-v400-noshrink ist vorhanden
überprüfe ob Backup Pfad vorhanden ist.
Checking ...
/home/nfs/public ist vorhanden
überprüfe ob NFS Mount point definiert ist.
Checking ...
/home/nfs/public ist definiert
überprüfe ob NFS Mount point im file system angelegt ist.
Checking...
/home/nfs/public ist angelegt
NFSVOL=192.168.0.238:/home/public/pi-ager-v400-noshrink
NFSPATH=/home/nfs/public
NFSMOUNT=/home/nfs/public
umount: /home/nfs/public: not mounted.
hänge NFS-Volume 192.168.0.238:/home/public/pi-ager-v400-noshrink ein
mount with options: nosuid,nodev
mount NFS-Volume 192.168.0.238:/home/public/pi-ager-v400-noshrink successfull. Image script continues
.
Load last backup file.
Backup path is  /home/nfs/public
Backup file is /home/nfs/public/PiAgerBackup_2024-02-12-103529.img
Backup path with file is /home/nfs/public/PiAgerBackup_2024-02-12-103529.img
Source File = /home/nfs/public/PiAgerBackup_2024-02-12-103529.img
do_copy     = false
my_image    = false
Using /home/nfs/public/PiAgerBackup_2024-02-12-103529.img as source and target
##########################################################################################
parted_output = 2:541065216B:15931539455B:15390474240B:ext4::;
partnum = 2
partstart = 541065216
loopback = /dev/loop0
##########################################################################################
parted_output_boot = 1:4194304B:541065215B:536870912B:fat32::lba;
partnum_boot = 1
partstart_boot = 4194304
loopback_boot = /dev/loop1
##########################################################################################
mount directory is /tmp/tmp.SfM3akt9CW
2024-02-12 10:39:10 URL:https://raw.githubusercontent.com/Tronje-the-Falconer/Pi-Ager/entwicklung/boo
t/firmware/setup.txt [3281/3281] -> "setup.txt" [1]
setup.txt copied to /tmp/tmp.SfM3akt9CW/boot/
cmdline.txt modified, added init=/usr/lib/raspberrypi-sys-mods/firstboot
rematch1 /tmp/
rematch2 tmp.SfM3akt9CW
change rootdir is tmp.SfM3akt9CW
/tmp
pi-ager_main.service disabled, will be enabled during setup_pi-ager.sh
Created symlink /etc/systemd/system/multi-user.target.wants/setup_pi-ager.service → /lib/systemd/system/setup_p
i-ager.service.
setup_pi-ager service enabled
Running in chroot, ignoring command 'is-active'
hostname changed to pi-ager
unmount /tmp/tmp.SfM3akt9CW/boot
unmount /tmp/tmp.SfM3akt9CW
Detaching loop devices from /home/nfs/public/PiAgerBackup_2024-02-12-103529.img
The image /home/nfs/public/PiAger_image_2024-02-12-103940.img was successfully created.
pi@pi-ager:/usr/local/bin $
```

5. Zip and deploy your new image.