1.) Prepare the x86_64 Debian Host

mkdir /home/youruser/assets this will be the target for the final image

Install all required packages for QEMU

sudo apt install qemu-efi-aarch64 qemu-system-arm virt-manager

Download the arm64 mini.iso from Debian

https://d-i.debian.org/daily-images/arm64/daily/netboot/

2.) Setup Virtual Machine in QEMU

open Virtual Machine Manager
select "Local install media (ISO image or CDROM)"
in "Architecture options" select Architecture: aarch64 and Machine Type: virt
next select the just downloaded mini.iso
next choose the operating system Debian 10
next set Memory to 1024 and CPUs to 4
next create a disk image and set size to 4 GiB
finally click "Finish" and click "Yes" to make Virtual Network active

3.) Install Debian for arm64 in your Virtual Machine

click into the black area of the VMs Window to capture Mouse and Keyboard
hit Enter to start text based Debian Installer
create root password and youruser with password as they will be on the final image
partition manually the disk image as follows
Partition 1: Size 100M, Name efi, Use as EFI System Partition, Bootable flag on
Partition 2: Size 100M, Name boot, Use as Ext 2 file system, Mount point /boot
Bootable flag off
Partition 3: Size max, Use as Ext 4 journaling file system, Mount point /
Bootable flag off
confirm that you don't want to create Swap Space by clicking <NO>
in "Software selection" select only SSH server and standard system utilities
and finish the installation, once finished reboot into the newly installed system

4.) DTB file handling

mkdir /boot/dtbs

nano /etc/kernel/postinst.d/copy-dtbs

```
#!/bin/sh

set -e
version="$1"

echo Copying current dtb files to /boot/dtbs....
cp -a /usr/lib/linux-image-${version}/. /boot/dtbs/
```

chmod +x /etc/kernel/postinst.d/copy-dtbs

/etc/kernel/postinst.d/copy-dtbs `uname -r`

5.) Bootloader configuration

```
mkdir /boot/extlinux

nano /boot/extlinux/extlinux.conf

TIMEOUT 2
PROMPT 1
DEFAULT debian

LABEL debian
MENU LABEL Debian
KERNEL /vmlinuz
INITRD /initrd.img
DEVICETREEDIR /dtbs
APPEND console=tty1 root=LABEL=root rw rootwait

apt purge grub-efi-arm64
apt autoremove
apt autoclean

shutdown -h now
```

6.) Creating tar archives of our VM

```
sudo modprobe nbd max_part=8

sudo qemu-nbd --connect=/dev/nbd0 /var/lib/libvirt/images/debian10-aarch64-clone.qcow2

sudo mount /dev/nbd0p2 /mnt
cd /mnt
sudo tar cfvzp /home/youruser/assets/debian-aarch64-bootfs.tar.gz .
cd
sudo umount /mnt

sudo mount /dev/nbd0p3 /mnt
cd /mnt
sudo tar cfvzp /home/youruser/assets/debian-aarch64-rootfs.tar.gz .
cd
sudo umount /mnt

sudo qemu-nbd -d /dev/nbd0
```

7.) Install Cross Compiler for building U-Boot on our x86_64 Debian Host

```
sudo apt install device-tree-compiler build-essential libssl-dev python3-dev bison
sudo apt install flex libssl-dev swig gcc-aarch64-linux-gnu gcc-arm-none-eabi
(sudo apt install gcc make bc git)
```

8.) Build U-Boot on our x86_64 Debian Host

```
git clone https://github.com/ARM-software/arm-trusted-firmware
cd arm-trusted-firmware
git tag                                    remember last stable (v2.3)
git checkout v2.3
make CROSS_COMPILE=aarch64-linux-gnu- PLAT=rk3328 bl31
cd ..
```

```
git clone git://git.denx.de/u-boot.git
cd u-boot
git tag                                          remember last stable (v2020.10)
git checkout v2020.10
ln -s /home/youruser/arm-trusted-firmware/build/rk3328/release/bl31/bl31.elf bl31.elf
make CROSS_COMPILE=aarch64-linux-gnu- BL31=bl31.elf rock64-rk3328_defconfig
make -j4 CROSS_COMPILE=aarch64-linux-gnu- BL31=bl31.elf all u-boot.itb

cp -r /home/youruser/u-boot/idbloader.img /home/youruser/assets/
cp -r /home/youruser/u-boot/u-boot.itb /home/youruser/assets/
```

9.) Flashing Debian to our Pine64 Rock64 SBC

`sudo fdisk /dev/sdX` type **o** this will clear out any partitions on the drive
type **p** to list partitions, there should be no partitions left
type **n**, then **p** for primary, **1** for the first partition on the drive, **32768** for the first sector, and **647167** for the last sector, then type **a** then type **n**, then **p** for primary, **2** for the second partition on the drive, **647168** for the first sector,and **28211199** for the last sector, then type **n**, then **p** for primary, **3** for the third partition on the drive, **28211200** for the first sector, and **30308351** for the last sector, then type **t**, and **3** for the third partition, and **82** for the Hex Code, then write the partition table and exit by typing **w**

```
cd /home/youruser/assets
mkdir boot                    this is in your home directory ! → /home/youruser/assets/boot
mkdir root                    this is in your home directory ! → /home/youruser/assets/root

sudo mkfs.ext2 -m0 -L boot /dev/sdX1
sudo mount /dev/sdX1 /home/youruser/assets/boot
cd /home/youruser/assets/boot
sudo tar xzvpf /home/youruser/assets/debian-aarch64-bootfs.tar.gz .
sync
cd ..
sudo umount /home/youruser/assets/boot

sudo mkfs.ext4 -L root /dev/sdX2
sudo mount /dev/sdX2 /home/youruser/assets/root
cd /home/youruser/assets/root
sudo tar xzvpf /home/youruser/assets/debian-aarch64-rootfs.tar.gz .
sync
cd ..

sudo nano /home/youruser/assets/root/etc/fstab                    amend as below

# /etc/fstab: static file system information.
#
# Use 'blkid' to print the universally unique identifier for a
# device; this may be used with UUID= as a more robust way to name devices
# that works even if disks are added and removed. See fstab(5).
#
# systemd generates mount units based on this file, see systemd.mount(5).
# Please run 'systemctl daemon-reload' after making changes here.
#
# <file system> <mount point>   <type>  <options>       <dump>  <pass>
/dev/mmcblk1p1  /boot           ext2    defaults          0       2
/dev/mmcblk1p2  /               ext4    errors=remount-ro 0       1
/dev/mmcblk1p3  swap            swap    defaults          0       0
/dev/sr0        /media/cdrom0   udf,iso9660 user,noauto     0       0
```

sudo nano /home/youruser/assets/root/etc/network/interfaces change interface to eth0

```
# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

source /etc/network/interfaces.d/*

# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
auto eth0
allow-hotplug eth0
iface eth0 inet dhcp
```

```
sudo umount /home/youruser/assets/root

sudo mkswap /dev/sdX3

cd /home/youruser/assets/
sudo dd if=idbloader.img of=/dev/sdX seek=64 conv=notrunc
sudo dd if=u-boot.itb of=/dev/sdX seek=16384 conv=notrunc
```

10.) Install the eMMC-Module onto your Pine64 Rock64 SBC, connecting HDMI, Mouse and Keyboard and power it up.

```
ip a
```
check that network is working

11.) Check the MAC address, may need spoofing if address is 12:ac:66:34:01:32 (1GB Board) or ae:44:ee:39:d1:65 (4GB Board)

```
ip link show eth0
```

If you MAC address is 12:ac:66:34:01:32 or ae:44:ee:39:d1:65 then do steps below, or the network will not work !

```
nano /etc/systemd/network/00-default.link

[Match]
MACAddress= 12:ac:66:34:01:32

[Link]
MACAddress=12:ac:66:02:02:02
NamePolicy=kernel database onboard slot path
```
change the last 3 bits to your liking, **DO NOT** change the first 3 bits (reserved for Manufacturer)

```
reboot
```
once board is up, check with ip link show eth0 for success

```
apt update
apt upgrade
apt dist-upgrade
apt autoremove
apt autoclean
```
perform system update

Done, enjoy your setup.