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1. New ROS master on Lubunto for Multimaster node for Willy

Because Multimaster is not available for Raspbian, node master node of Willy will be using Lubuntu. ROS.org states that the best way is to use a pre-installed version http://wiki.ros.org/ROSberryPi/Installing%20ROS%20Kinetic%20on%20the%20Raspberry%20Pi

An SD Card Image with Ubuntu 16.04 (LXDE) and ROS Kinetic installed can be downloaded here for the Raspberry Pi 3. The here refers to: https://downloads.ubiquityrobotics.com/ On this site the left button is chosen. This brings to https://downloads.ubiquityrobotics.com/pi.html.

For Willy the latest version (2018-11-15-ubiquity-xenial-lxde) is choosen: https://cdn.ubiquityrobotics.net/2018-11-15-ubiquity-xenial-lxde-raspberry-pi.img.xz

The SD image is also stored on the SharePoint site of Willy.

The image is flashed to the 16 GB SD card with Rufus 3.4, but any flash program can be used.

The standard user on the node is ubuntu with the password ubuntu as is stated on the site of the supplier.

The following adjustments to the image are made: To ensure that the startup scripts from the supplier are disabled:

```
sudo systemctl disable magni-base
```

In /etc/ubiquity/env.sh the starting of roscore is already added, through roscore.services

Change /etc/ubiquity/env.sh

```
remove .local from export ROS_HOSTNAME=$(hostname).local
```

Change /etc/systemd/system/roscore.service Add extra line after line starting with ExecStart

```
ExecStartPost=/bin/sh -c ". /home/ubuntu/multimaster.sh
```

Add file /home/ubuntu/multimaster.sh:

```
rosrun master_discovery_fkie master_discovery >/dev/null 2>&1 &
rosrun master_sync_fkie master_sync >/dev/null 2>&1 &
```

Update and upgrade the OS:

```
sudo apt-get update
sudo apt-get upgrade
```

Through the GUI WLAN has to be disabled.

Install openssh server and check status:

```
sudo apt-get install openssh-server
sudo service ssh status
```

The complete environment of ROS with multimaster is included.

The node on Willy will be the ROS master with portnumber 11311, which is the standard setting.

Enable multicast feature on the node: edit the /etc/sysctl.conf file and add the following line:

```
net.ipv4.icmp_echo_ignore_broadcasts=0
```

Edit /etc/hostnode:

```
Change hostname to brainnode
```

edit /etc/hosts:

```
add all the hosts of Willy and Skylab. The correct info can be found on SharePoint.
```

Install VNC on the node:

```
sudo apt-get update
sudo apt install xfce4 xfce4-goodies tightvncserver
```

Add a secure password on VNC with:

```
vncserver
```

Reference for VNC: https://www.digitalocean.com/community/tutorials/how-to-install-and-configure-vnc-on-ubuntu-16-04