IOT device network scanner

Installation manual

Bachelor in the IT-Factory
Keuzerichting Cloud and cyber security

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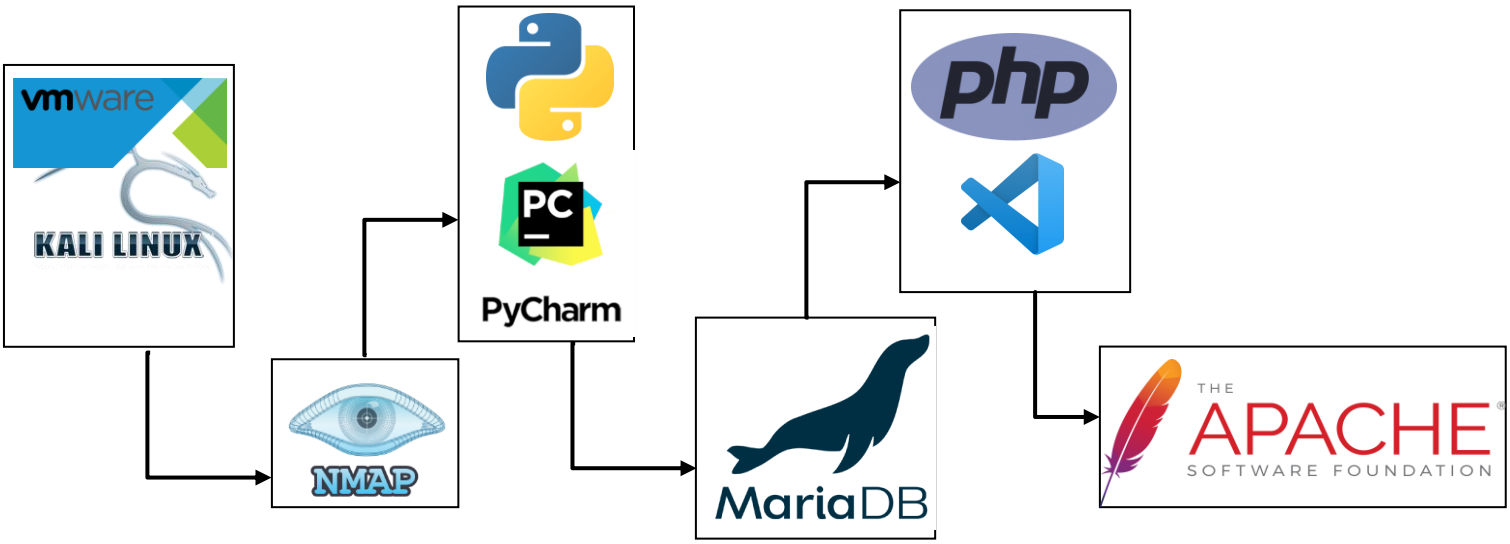
1 INTRODUCTION

The past weeks I had the opportunity to create an application called the IOT Devices network scanner. You should use this application to check if there are unwanted devices or unwanted open ports on devices within your network. The focus of this application lays on IOT devices, IOT devices are devices that help you with your daily routines like a smart thermostat or smart light switches. Why did we focus on IOT devices? Because IOT device are not that rare anymore and if they are configured incorrectly could cause some serious network breaches.

Before I start explaining how to install the IOT device network scanner I would like to explain what we are using and how it works. We used a lot of tools and software to create but also to run this application.



The first thing you need is to install a Kali Linux virtual machine. We used VMWare Workstation Pro. This virtual machine is the base of the whole project.

The scanning software we use is called nmap this is an open source network scanner. We created a Pyhton program using PyCharm that does the nmap network scan and pushes the wanted information to a local database. MariaDB is the software that handles the storage of the information.

We used Visual Studio Code to create our front-end application and as coding language mainly PHP. This way we could easily connect to our database and retrieve data.

After we completed the project we wanted to make it visible for users. So we used the Apache software to publish the application. If wanted you also can install PHPMyAdmin to monitor your database.

In this document I would like to explain how to install all the needed software correctly. I also would like to lead you through the configuration of these particular services. If all the packages are installed and configured correctly, I will explain step by step how you can install the application itself.

If you want to know how to use this application I would suggested reading the User manual. In this document I lead you step by step through every page and all the features of the application.

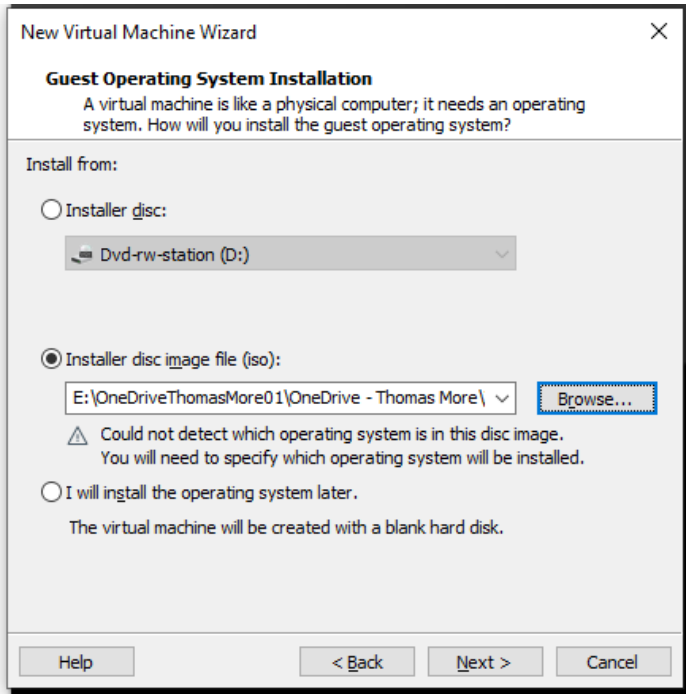
2 CREATE VIRTUAL MACHINE IN VMWARE WORKSTATION

For testing purpose I used an Virtual Machine. This way my configurations don't affect my local device. In this step I would like to explain how I created my virtual machine using VMware Workstation. I used VMware Workstation because I am more experienced using this software and I think it is easy to create and manage you virtual machines.

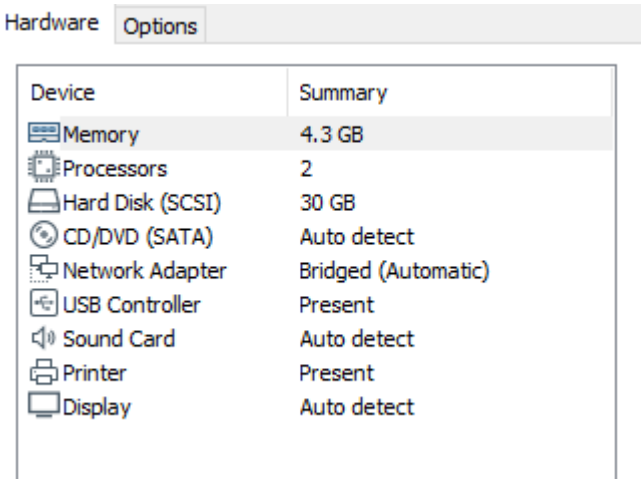
After creating a typical virtual machine it is time to choice a Operating System. This choice was rather obvious. I chose to use Kali Linux because Kali already had scanning software installed.

The settings of the virtual machine are decisions I made looking at the hardware I use on my local device. You can choose to use less Memory, Processors,… but this will affect the performance of you virtual machine. After the installation is finished it is very important to update your machine.

2.1 Select ISO file and Operating system



2.2 Virtual machine settings



2.3 Update Virtual machine

Sudo apt update

Sudo apt upgrade -y

2.4 Install VMWare tools

```
┌──(nemo9㉿nemo9)-[~]
└─$ sudo apt-get -y install open-vm-tools-desktop fuse && reboot
```

3 INSTALL PYTHON

I needed to write a backend script that performs a nmap scan uploads the data to a database. I chose to use Python as programming language because it is easy in implement the needed modules like nmap.

I used PyCharm as Python development environment because this tool is free to use and is compatible with Kali Linux. You only need to make sure you open this tool as root user otherwise you are not able to run certain scripts.

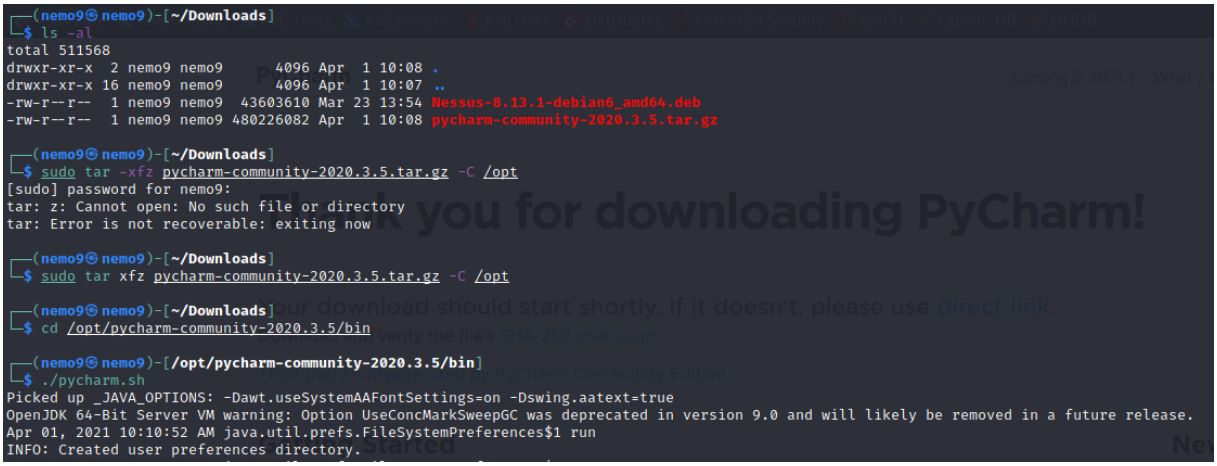
3.1 Install python

```
┌──(nemo9㉿nemo9)-[~/Desktop]
└─$ sudo apt-get install python3.9
Reading package lists ... Done
Building dependency tree ... Done
Reading state information ... Done
python3.9 is already the newest version (3.9.2-1).
python3.9 set to manually installed.
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
```

3.2 Install nmap for python

```
┌──(nemo9㉿nemo9)-[~/Desktop]
└─$ sudo apt-get install python3-nmap
Reading package lists ... Done
Building dependency tree ... Done
Reading state information ... Done
The following package was automatically installed and is no longer required:
  linux-image-5.10.0-kali3-amd64
Use 'sudo apt autoremove' to remove it.
The following NEW packages will be installed:
  python3-nmap
0 upgraded, 1 newly installed, 0 to remove and 0 not upgraded.
Need to get 23.5 kB of archives.
After this operation, 100 kB of additional disk space will be used.
Get:1 http://kali.download/kali kali-rolling/main amd64 python3-nmap all 0.6.1-1.1 [23.5 kB]
Fetched 23.5 kB in 1s (33.4 kB/s)
Selecting previously unselected package python3-nmap.
(Reading database ... 280819 files and directories currently installed.)
Preparing to unpack .../python3-nmap_0.6.1-1.1_all.deb ...
Unpacking python3-nmap (0.6.1-1.1) ...
Setting up python3-nmap (0.6.1-1.1) ...
```

3.3 Install Pycharm



4 INSTALL MARIADB

After the scan is performed I need to make sure the data is stored in a database. Because I run the Kali Linux distribution I chose to use MarieDB. I had to choice between MariaDB and MySQL but MySQL isn't that compatible with Kali as MariaDB. If you follow these steps your installation will be quite easy.

https://computingforgeeks.com/how-to-install-mariadb-on-kali-linux/

1. We'll use the MariaDB apt repository for Debian 10 (Buster). Ensure you install the following software dependencies.

```
sudo apt -y install software-properties-common gnupg2
```

2. Add MariaDB APT repository to Kali Linux.

```
sudo apt-key adv --recv-keys --keyserver keyserver.ubuntu.com
0xF1656F24C74CD1D8
echo "deb [arch=amd64]
http://mariadb.mirror.liquidtelecom.com/repo/10.5/debian buster main" |
sudo tee /etc/apt/sources.list.d/mariadb.list
```

3. Update your APT index before the actual installation of MariaDB on Kali Linux.

```
$ sudo apt update
Get:1 http://mariadb.mirror.liquidtelecom.com/repo/10.5/debian buster
InRelease [3,154 B]
Get:2 http://mariadb.mirror.liquidtelecom.com/repo/10.5/debian
buster/main amd64 Packages [28.0 kB]
Hit:3 http://kali.download/kali kali-rolling InRelease
Fetched 31.1 kB in 1s (29.4 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
839 packages can be upgraded. Run 'apt list --upgradable' to see them.
```

4. After addition of the repository, we can install MariaDB server and client software packages on Kali Linux using the apt package manager.

```
sudo apt install mariadb-server mariadb-client
```

5. If you had mysql-common package installed, you may have to remove it.

```
sudo apt remove mysql-common
```

6. Hit the **y** key on the keyboard when prompted to begin installation.

```
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  galera-4 libdbd-mariadb-perl libdbi-perl libhtml-template-perl
  libreadline5 libterm-readkey-perl mariadb-client-10.5
  mariadb-client-core-10.5 mariadb-common mariadb-server-10.5
  mariadb-server-core-10.5 rsync
Suggested packages:
  libclone-perl libmldbm-perl libnet-daemon-perl libsql-statement-perl
  libipc-sharedcache-perl mailx mariadb-test netcat-openbsd
The following NEW packages will be installed:
  galera-4 libdbd-mariadb-perl libdbi-perl libhtml-template-perl
  libreadline5 libterm-readkey-perl mariadb-client mariadb-client-10.5
  mariadb-client-core-10.5 mariadb-server mariadb-server-10.5
  mariadb-server-core-10.5 rsync
The following packages will be upgraded:
  mariadb-common
1 upgraded, 13 newly installed, 0 to remove and 130 not upgraded.
Need to get 27.3 MB of archives.
After this operation, 217 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
....
```

7. Start and enable mariadb service after installation.

```
sudo systemctl enable --now mariadb
```

8. Confirm the service is started.

```
$ systemctl status mariadb
130 ×
● mariadb.service - MariaDB 10.5.8 database server
     Loaded: loaded (/lib/systemd/system/mariadb.service; enabled;
vendor preset: disabled)
    Drop-In: /etc/systemd/system/mariadb.service.d
             └─migrated-from-my.cnf-settings.conf
     Active: active (running) since Fri 2021-01-22 14:18:15 EST; 19s
ago
       Docs: man:mariadbd(8)
             https://mariadb.com/kb/en/library/systemd/
   Main PID: 7012 (mariadbd)
     Status: "Taking your SQL requests now..."
      Tasks: 15 (limit: 2274)
     Memory: 108.2M
        CPU: 482ms
     CGroup: /system.slice/mariadb.service
             └─7012 /usr/sbin/mariadbd
```

5 INSTALL PHPMYADMIN

I wanted a way to check my tables in my database. This is why I installed PHPMyAdmin. It is an easy service to install and use. Before you install PHPMyAdmin, you also need to install Apache. We also need the Apache services to host our PHP project.

https://computingforgeeks.com/install-phpmyadmin-on-kali-linux/

1. install PHP and Apache

```
┌──(nemo9㉿nemo9)-[/etc]
└─$ sudo apt -y install wget php php-cgi php-mysqli php-pear php-mbstring libapache2-mod-php php-common php-phpseclib php-mysql
```

2. Check state

```
┌──(nemo9㉿nemo9)-[/etc]
└─$ php --version
PHP 7.4.15 (cli) (built: Feb 20 2021 09:45:56) ( NTS )
Copyright (c) The PHP Group
Zend Engine v3.4.0, Copyright (c) Zend Technologies
    with Zend OPcache v7.4.15, Copyright (c), by Zend Technologies
```

3. Install PhpMyAdmin

```
┌──(nemo9㉿nemo9)-[/etc]
└─$ sudo wget https://files.phpmyadmin.net/phpMyAdmin/5.0.4/phpMyAdmin-5.0.4-all-languages.tar.gz
[sudo] password for nemo9:
--2021-04-09 11:13:44--  https://files.phpmyadmin.net/phpMyAdmin/5.0.4/phpMyAdmin-5.0.4-all-languages.tar.gz
Resolving files.phpmyadmin.net (files.phpmyadmin.net)... 2a02:6ea0:c000::10, 2a02:6ea0:c000::6, 2a02:6ea0:c000::4, ...
Connecting to files.phpmyadmin.net (files.phpmyadmin.net)|2a02:6ea0:c000::10|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 12898226 (12M) [application/octet-stream]
Saving to: 'phpMyAdmin-5.0.4-all-languages.tar.gz'

phpMyAdmin-5.0.4-all-languages.tar.gz   100%[=====================================================================================>]  12.30M  22.5MB/s    in 0.5s

2021-04-09 11:13:45 (22.5 MB/s) - 'phpMyAdmin-5.0.4-all-languages.tar.gz' saved [12898226/12898226]
```

4. Move the folder created from extraction to /usr/share/phpMyAdmin directory

```
┌──(nemo9㉿nemo9)-[/etc]
└─$ sudo mv phpMyAdmin-*/ /usr/share/phpmyadmin
```

5. Create necessary folders with correct rights

```
┌──(nemo9㉿nemo9)-[/etc]
└─$ sudo mkdir -p /var/lib/phpmyadmin/tmp

┌──(nemo9㉿nemo9)-[/etc]
└─$ sudo chown -R www-data:www-data /var/lib/phpmyadmin

┌──(nemo9㉿nemo9)-[/etc]
└─$ sudo mkdir /etc/phpmyadmin/
```

6 PHP PROJECT

This is a last step of the installation manual. In this step you need to install the PHP project itself. You already have the Apache service running you only need to download the PHP project and place it in the correct directory. I created this project in Visual Studio Code. You need to start Visual Studio Code as root user otherwise it won't run.

1. Run Visual studio code as root

```
┌──(nemo9㉿nemo9)-[~/Desktop/Script]
└─$ sudo code --user-data-dir="~/.vscode-root"
```

2. Apache directory

```
┌──(nemo9㉿nemo9)-[/var/www/html]
└─$ ls -al
total 40
drwxr-xr-x  7 root root 4096 May 17 12:55 .
drwxr-xr-x  3 root root 4096 Mar 12 13:30 ..
drwxr-xr-x 16 root root 4096 Apr 15 15:15 bower_components
drwxr-xr-x  2 root root 4096 Apr 15 15:15 config
drwxr-xr-x  4 root root 4096 Apr 15 15:15 dist
-rwxr-xr-x  1 root root   49 Apr 15 15:15 index.php
drwxr-xr-x  2 root root 4096 Apr 15 15:15 js
drwxr-xr-x  2 root root 4096 May 19 11:53 pages
-rwxrwxrwx  1 root root 3260 May 17 14:08 RangeScan.py
-rwxrwxrwx  1 root root 3204 May 17 14:19 TotalNetworkScan.py
```