



Διαγωνισμός Ανοικτών Τεχνολογιών στην Εκπαίδευση

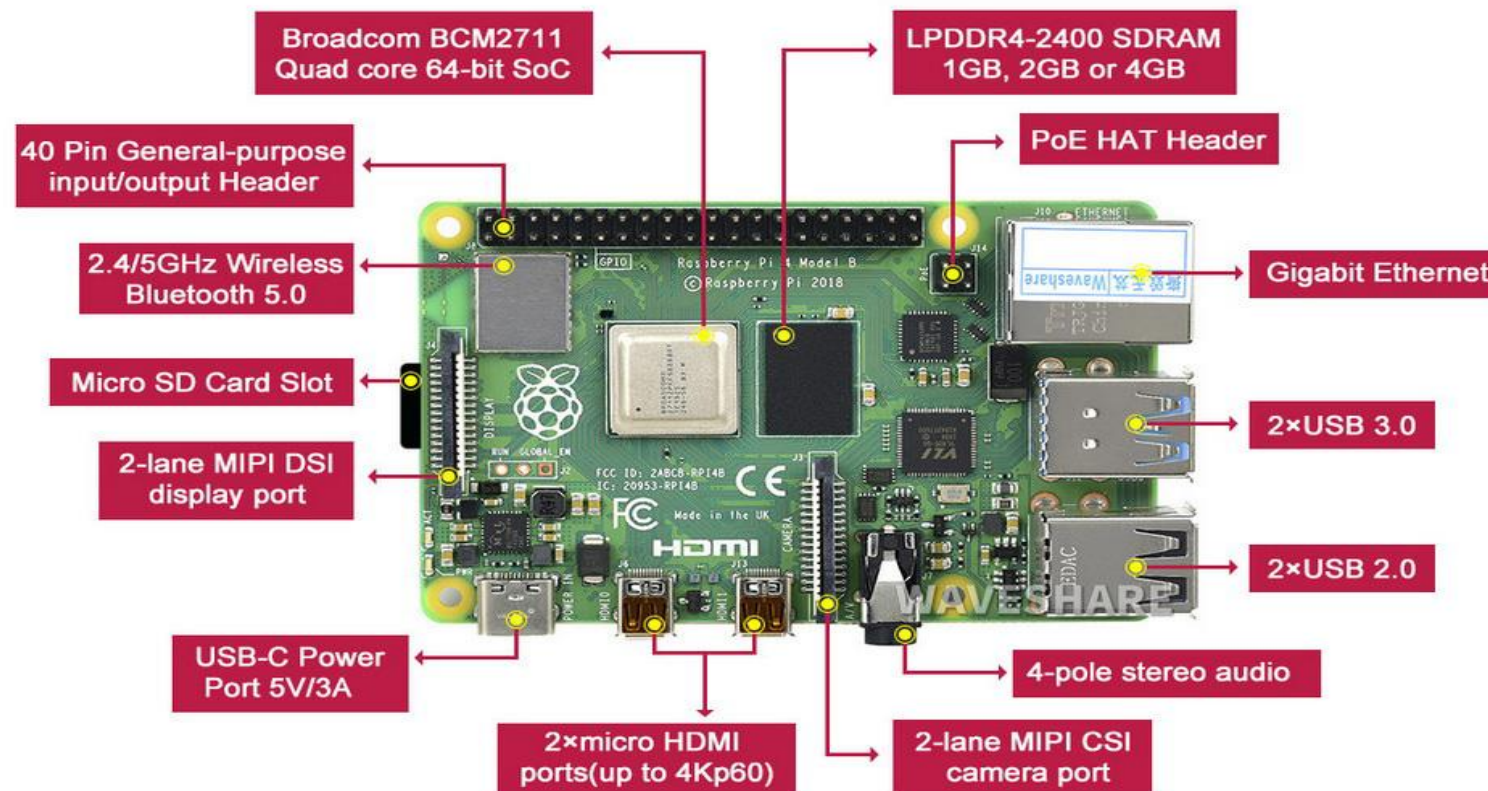
Απομακρυσμένος έλεγχος και συνεργασία έξυπνου εργαστηρίου Πληροφορικής με εργαστήριο Ηλεκτρικών Εγκαταστάσεων, με χρήση Raspberry Pi και σύγχρονων αισθητηρίων αυτοματισμού. Σύγχρονες μετρήσεις πιστοποίησης των ηλεκτρικών τους εγκαταστάσεων.

Ομάδα: SmartWiseOwl

Εσπερινό ΕΠΑΛ Ιεράπετρας

Εισαγωγή στο Raspberry Pi 4

- Κάναμε μια εισαγωγή στο Raspberry Pi 4 για το τι είναι και ποιες είναι οι δυνατότητές του ως ένας μικροπολογιστής και ως microcontroller .

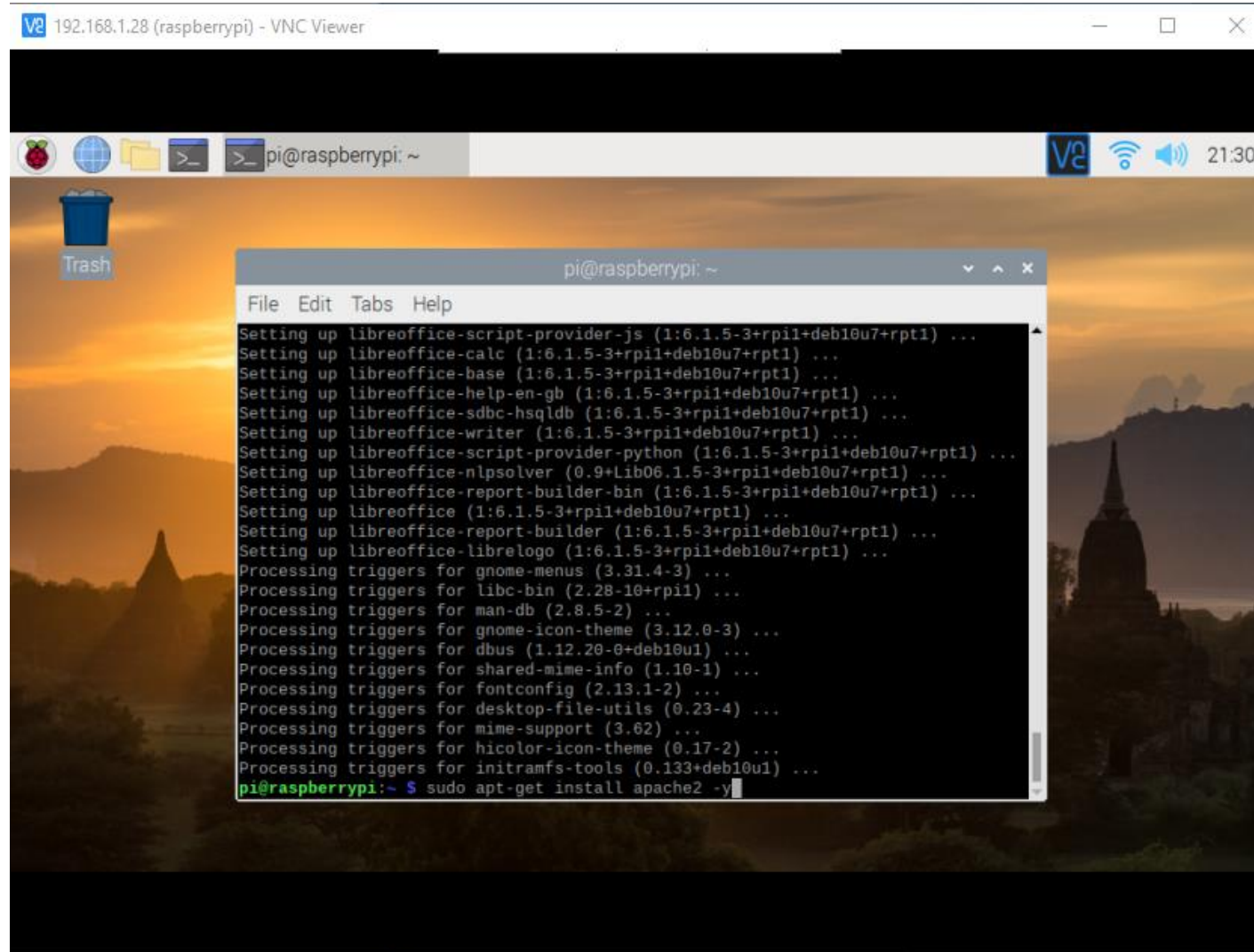


Δημιουργία – Στήσιμο του Web Server

- Στο Raspberry Pi 4 που θα έχει τη θέση το Server θα εγκαταστήσουμε τον Apache Server και για να μπορέσουμε να ελέγξουμε απομακρυσμένα τα αισθητήρια αυτοματισμού τόσο του Εργαστηρίου Πληροφορικής όσο και του Εργαστηρίου της Ηλεκτρολογίας.



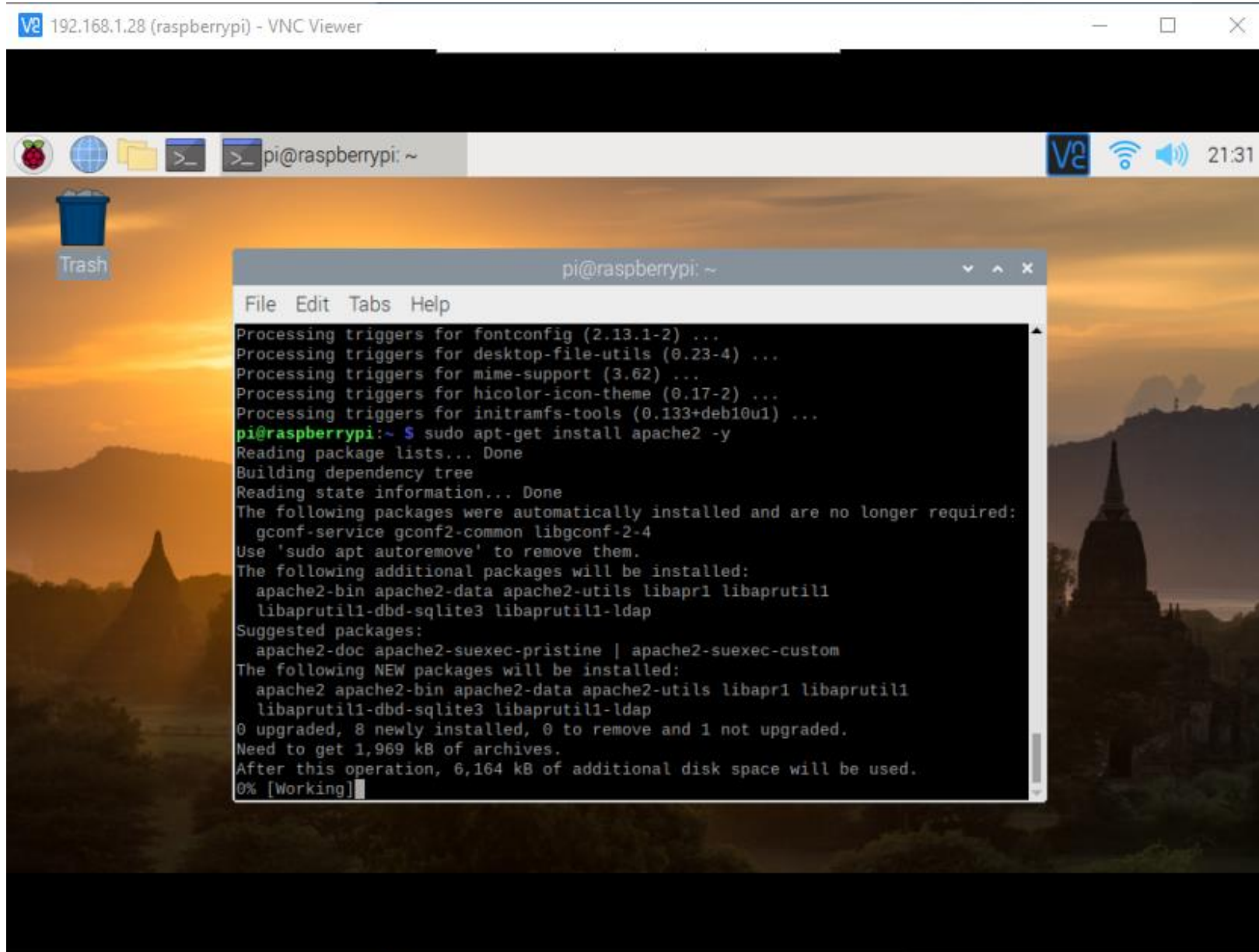
Install Apache Server – Εγκατάσταση Apache Server



The screenshot shows a Raspberry Pi desktop environment viewed through a VNC viewer. The desktop background is a scenic image of a sunset over a landscape with a pagoda. A terminal window is open in the center, displaying the output of the command `sudo apt-get install apache2 -y`. The terminal output shows the installation of various LibreOffice components and the processing of triggers for several system packages. The terminal window has a menu bar with 'File', 'Edit', 'Tabs', and 'Help'. The desktop includes a 'Trash' icon and a taskbar at the top with icons for the Raspberry Pi, a globe, a folder, and a terminal. The VNC viewer window title is '192.168.1.28 (raspberrypi) - VNC Viewer'.

```
192.168.1.28 (raspberrypi) - VNC Viewer
pi@raspberrypi: ~
Trash
pi@raspberrypi: ~
File Edit Tabs Help
Setting up libreoffice-script-provider-js (1:6.1.5-3+rpil+deb10u7+rpt1) ...
Setting up libreoffice-calc (1:6.1.5-3+rpil+deb10u7+rpt1) ...
Setting up libreoffice-base (1:6.1.5-3+rpil+deb10u7+rpt1) ...
Setting up libreoffice-help-en-gb (1:6.1.5-3+rpil+deb10u7+rpt1) ...
Setting up libreoffice-sdbc-hsqldb (1:6.1.5-3+rpil+deb10u7+rpt1) ...
Setting up libreoffice-writer (1:6.1.5-3+rpil+deb10u7+rpt1) ...
Setting up libreoffice-script-provider-python (1:6.1.5-3+rpil+deb10u7+rpt1) ...
Setting up libreoffice-nlpsolver (0.9+Lib06.1.5-3+rpil+deb10u7+rpt1) ...
Setting up libreoffice-report-builder-bin (1:6.1.5-3+rpil+deb10u7+rpt1) ...
Setting up libreoffice (1:6.1.5-3+rpil+deb10u7+rpt1) ...
Setting up libreoffice-report-builder (1:6.1.5-3+rpil+deb10u7+rpt1) ...
Setting up libreoffice-librelogo (1:6.1.5-3+rpil+deb10u7+rpt1) ...
Processing triggers for gnome-menus (3.31.4-3) ...
Processing triggers for libc-bin (2.28-10+rpil) ...
Processing triggers for man-db (2.8.5-2) ...
Processing triggers for gnome-icon-theme (3.12.0-3) ...
Processing triggers for dbus (1.12.20-0+deb10u1) ...
Processing triggers for shared-mime-info (1.10-1) ...
Processing triggers for fontconfig (2.13.1-2) ...
Processing triggers for desktop-file-utils (0.23-4) ...
Processing triggers for mime-support (3.62) ...
Processing triggers for hicolor-icon-theme (0.17-2) ...
Processing triggers for initramfs-tools (0.133+deb10u1) ...
pi@raspberrypi:~$ sudo apt-get install apache2 -y
```


Install Apache Server – Εγκατάσταση Apache Server



The screenshot shows a Raspberry Pi desktop environment with a sunset background. A terminal window is open, displaying the command `sudo apt-get install apache2 -y` and its output. The output shows the processing of triggers for various packages, the building of a dependency tree, and the installation of Apache2 and its dependencies. The terminal window has a title bar that reads `pi@raspberrypi: ~`. The desktop environment includes a taskbar at the top with icons for the Raspberry Pi logo, a globe, a folder, and a terminal. The system status bar at the top right shows the time as 21:31 and the network status.

```
192.168.1.28 (raspberrypi) - VNC Viewer

pi@raspberrypi: ~
File Edit Tabs Help
Processing triggers for fontconfig (2.13.1-2) ...
Processing triggers for desktop-file-utils (0.23-4) ...
Processing triggers for mime-support (3.62) ...
Processing triggers for hicolor-icon-theme (0.17-2) ...
Processing triggers for initramfs-tools (0.133+deb10u1) ...
pi@raspberrypi:~$ sudo apt-get install apache2 -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following packages were automatically installed and are no longer required:
  gconf-service gconf2-common libgconf-2-4
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  apache2-bin apache2-data apache2-utils libapr1 libaprutil1
  libaprutil1-dbd-sqlite3 libaprutil1-ldap
Suggested packages:
  apache2-doc apache2-suexec-pristine | apache2-suexec-custom
The following NEW packages will be installed:
  apache2 apache2-bin apache2-data apache2-utils libapr1 libaprutil1
  libaprutil1-dbd-sqlite3 libaprutil1-ldap
0 upgraded, 8 newly installed, 0 to remove and 1 not upgraded.
Need to get 1,969 kB of archives.
After this operation, 6,164 kB of additional disk space will be used.
0% [Working]
```

Δικαιώματα στα αρχεία του Apache Server

V2 192.168.1.28 (raspberrypi) - VNC Viewer

pi@raspberrypi: ~ [Apache2 Debian Def...]

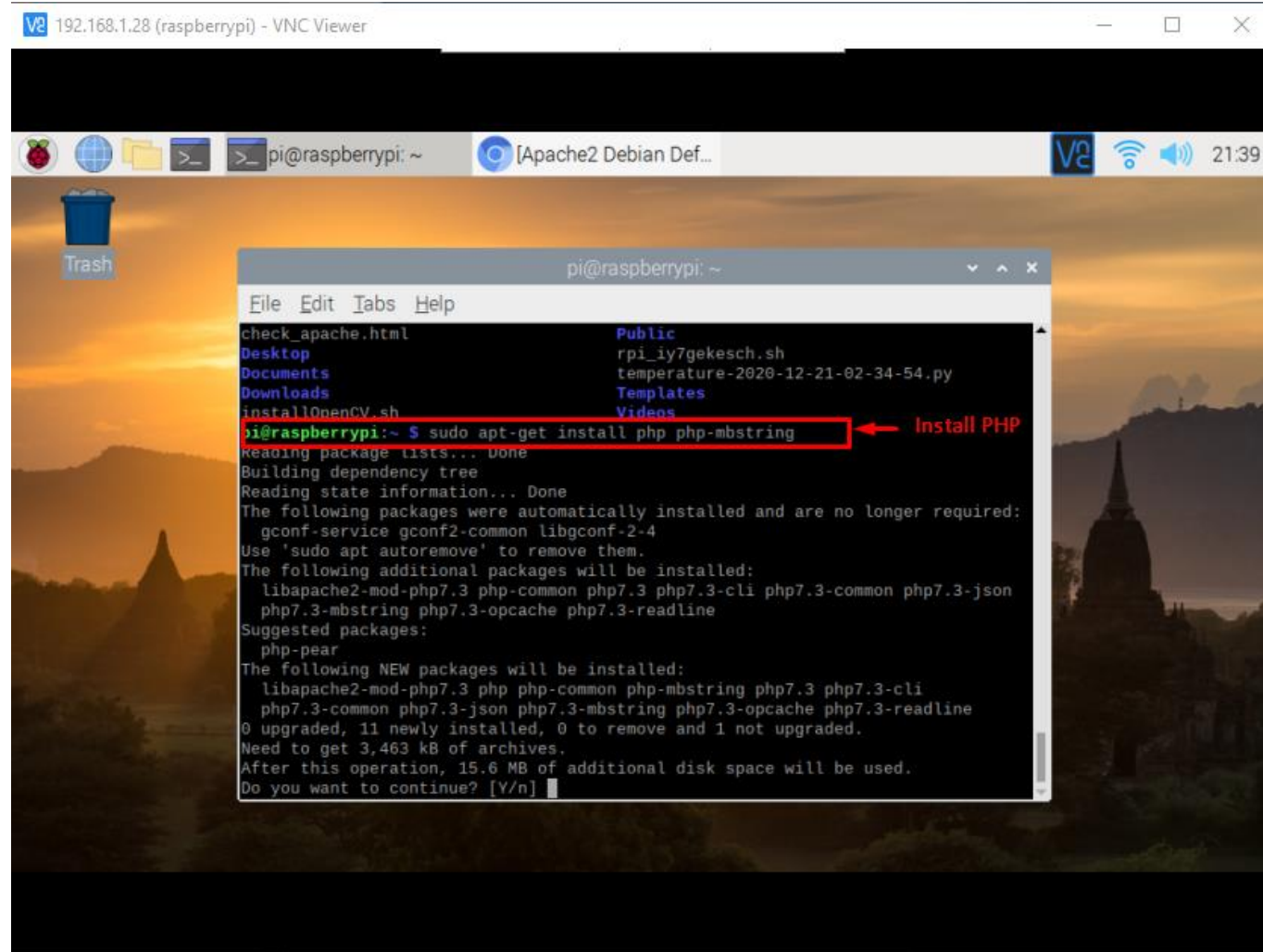
Trash

```
pi@raspberrypi: ~  
File Edit Tabs Help  
Enabling conf charset.  
Enabling conf localized-error-pages.  
Enabling conf other-vhosts-access-log.  
Enabling conf security.  
Enabling conf serve-cgi-bin.  
Enabling site 000-default.  
Created symlink /etc/systemd/system/multi-user.target.wants/apache2.service → /lib/systemd/system/apache2.service.  
Created symlink /etc/systemd/system/multi-user.target.wants/apache-htcacheclean.service → /lib/systemd/system/apache-htcacheclean.service.  
Processing triggers for systemd (241-7-deb10u7+rpil) ...  
Processing triggers for man-db (2.8.5-2) ...  
Processing triggers for libc-bin (2.28-10+rpil) ...  
pi@raspberrypi:~$ sudo chown -R pi:www-data /var/www/html/  
pi@raspberrypi:~$ sudo chmod -R 770 /var/www/html/  
pi@raspberrypi:~$ wget -O check_apache.html http://127.0.0.1  
--2021-04-17 21:34:49-- http://127.0.0.1/  
Connecting to 127.0.0.1:80... connected.  
HTTP request sent, awaiting response... 200 OK  
Length: 10701 (10K) [text/html]  
Saving to: 'check_apache.html'  
  
check_apache.html 100%[=====] 10.45K --.-KB/s in 0s
```

Δικαιώματα στα αρχεία του Server

Έλεγχος λειτουργίας Apache2

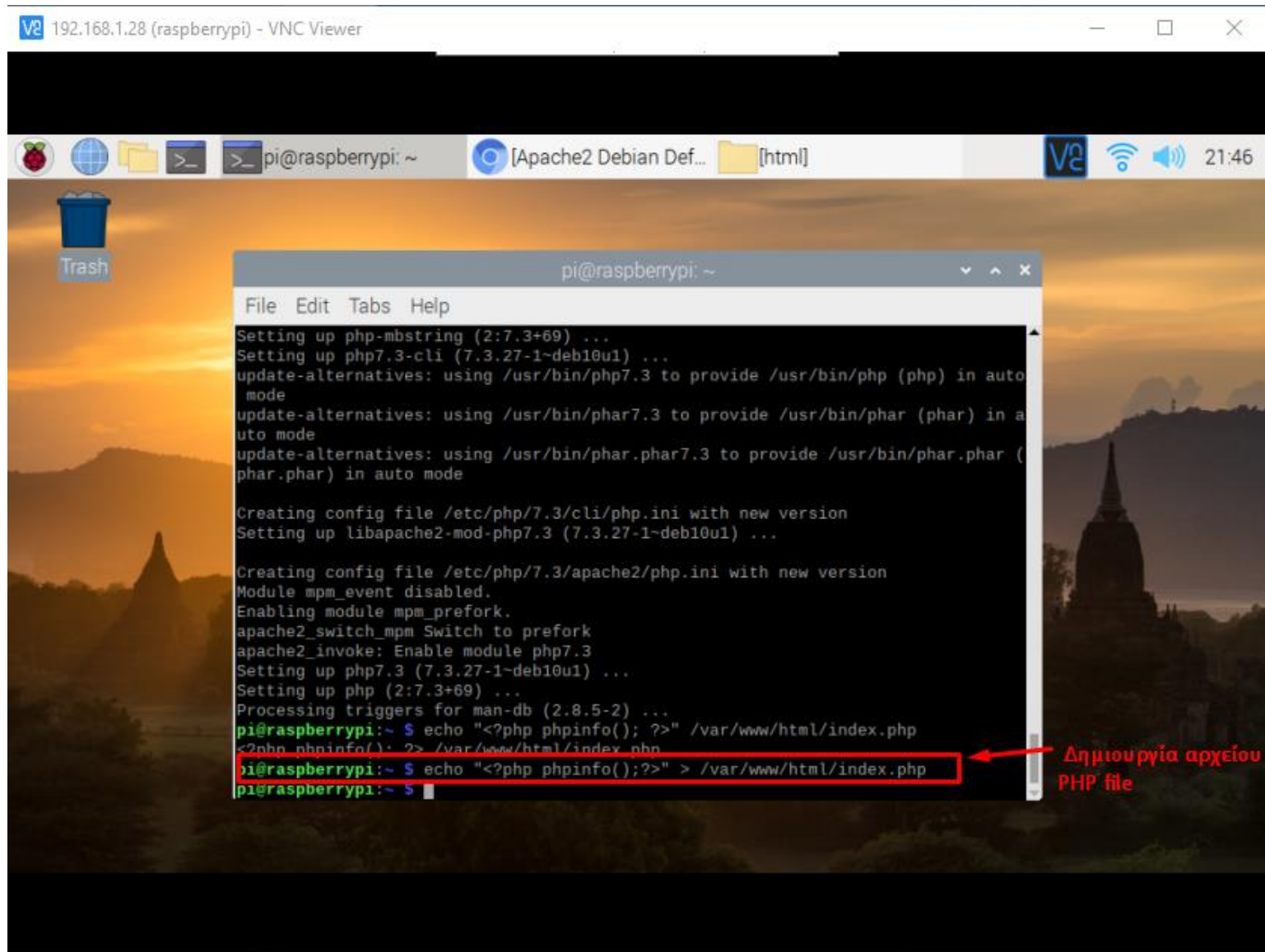
Install PHP – Εγκατάσταση PHP



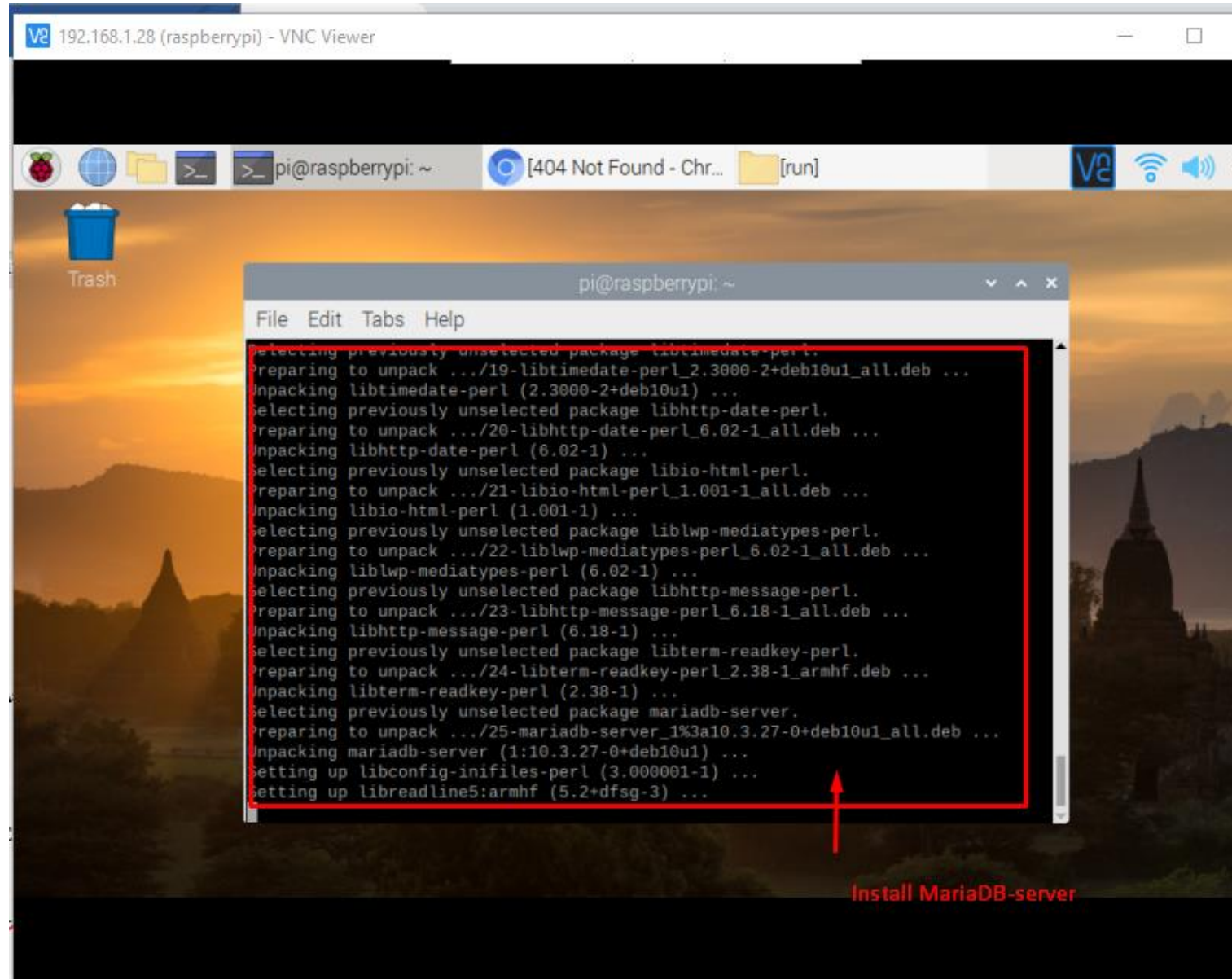
The screenshot shows a Raspberry Pi desktop environment with a sunset background. A terminal window is open, displaying the command to install PHP and its dependencies. The command is highlighted with a red box, and a red arrow points to it with the text "Install PHP".

```
pi@raspberrypi: ~  
File Edit Tabs Help  
check_apache.html Public  
Desktop rpi_iy7gekesch.sh  
Documents temperature-2020-12-21-02-34-54.py  
Downloads Templates  
installOpenCV.sh Videos  
pi@raspberrypi:~ $ sudo apt-get install php php-mbstring  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
The following packages were automatically installed and are no longer required:  
  gconf-service gconf2-common libgconf-2-4  
Use 'sudo apt autoremove' to remove them.  
The following additional packages will be installed:  
  libapache2-mod-php7.3 php-common php7.3 php7.3-cli php7.3-common php7.3-json  
  php7.3-mbstring php7.3-opcache php7.3-readline  
Suggested packages:  
  php-pear  
The following NEW packages will be installed:  
  libapache2-mod-php7.3 php php-common php-mbstring php7.3 php7.3-cli  
  php7.3-common php7.3-json php7.3-mbstring php7.3-opcache php7.3-readline  
0 upgraded, 11 newly installed, 0 to remove and 1 not upgraded.  
Need to get 3,463 kB of archives.  
After this operation, 15.6 MB of additional disk space will be used.  
Do you want to continue? [Y/n]
```

Δημιουργία PHP file (αρχείου) το αρχείο index.php



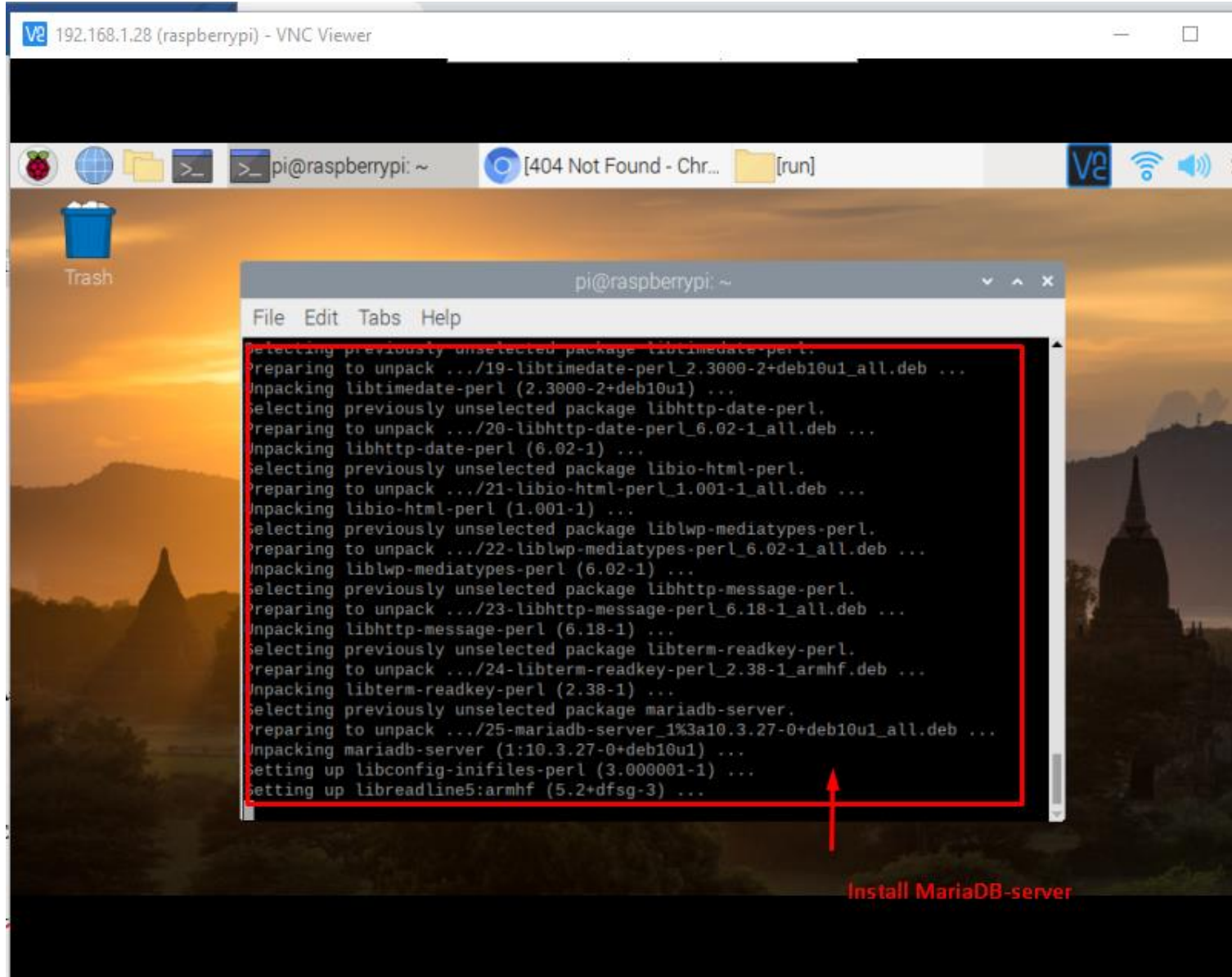
Εγκατάσταση Βάσης Δεδομένων



The screenshot shows a Raspberry Pi desktop environment with a sunset background. A terminal window titled 'pi@raspberrypi: ~' is open, displaying the output of a package installation command. The output lists several Perl-related packages being installed, followed by 'mariadb-server'. A red box highlights the terminal output, and a red arrow points to the 'Install MariaDB-server' text at the bottom.

```
pi@raspberrypi: ~  
File Edit Tabs Help  
Selecting previously unselected package libtimedate-perl.  
Preparing to unpack .../19-libtimedate-perl_2.3000-2+deb10u1_all.deb ...  
Unpacking libtimedate-perl (2.3000-2+deb10u1) ...  
Selecting previously unselected package libhttp-date-perl.  
Preparing to unpack .../20-libhttp-date-perl_6.02-1_all.deb ...  
Unpacking libhttp-date-perl (6.02-1) ...  
Selecting previously unselected package libio-html-perl.  
Preparing to unpack .../21-libio-html-perl_1.001-1_all.deb ...  
Unpacking libio-html-perl (1.001-1) ...  
Selecting previously unselected package liblwp-mediatypes-perl.  
Preparing to unpack .../22-liblwp-mediatypes-perl_6.02-1_all.deb ...  
Unpacking liblwp-mediatypes-perl (6.02-1) ...  
Selecting previously unselected package libhttp-message-perl.  
Preparing to unpack .../23-libhttp-message-perl_6.18-1_all.deb ...  
Unpacking libhttp-message-perl (6.18-1) ...  
Selecting previously unselected package libterm-readkey-perl.  
Preparing to unpack .../24-libterm-readkey-perl_2.38-1_armhf.deb ...  
Unpacking libterm-readkey-perl (2.38-1) ...  
Selecting previously unselected package mariadb-server.  
Preparing to unpack .../25-mariadb-server_1%3a10.3.27-0+deb10u1_all.deb ...  
Unpacking mariadb-server (1:10.3.27-0+deb10u1) ...  
Setting up libconfig-inifiles-perl (3.000001-1) ...  
Setting up libreadline5:armhf (5.2+dfsg-3) ...  
Install MariaDB-server
```

Εγκατάσταση Βάσης Δεδομένων

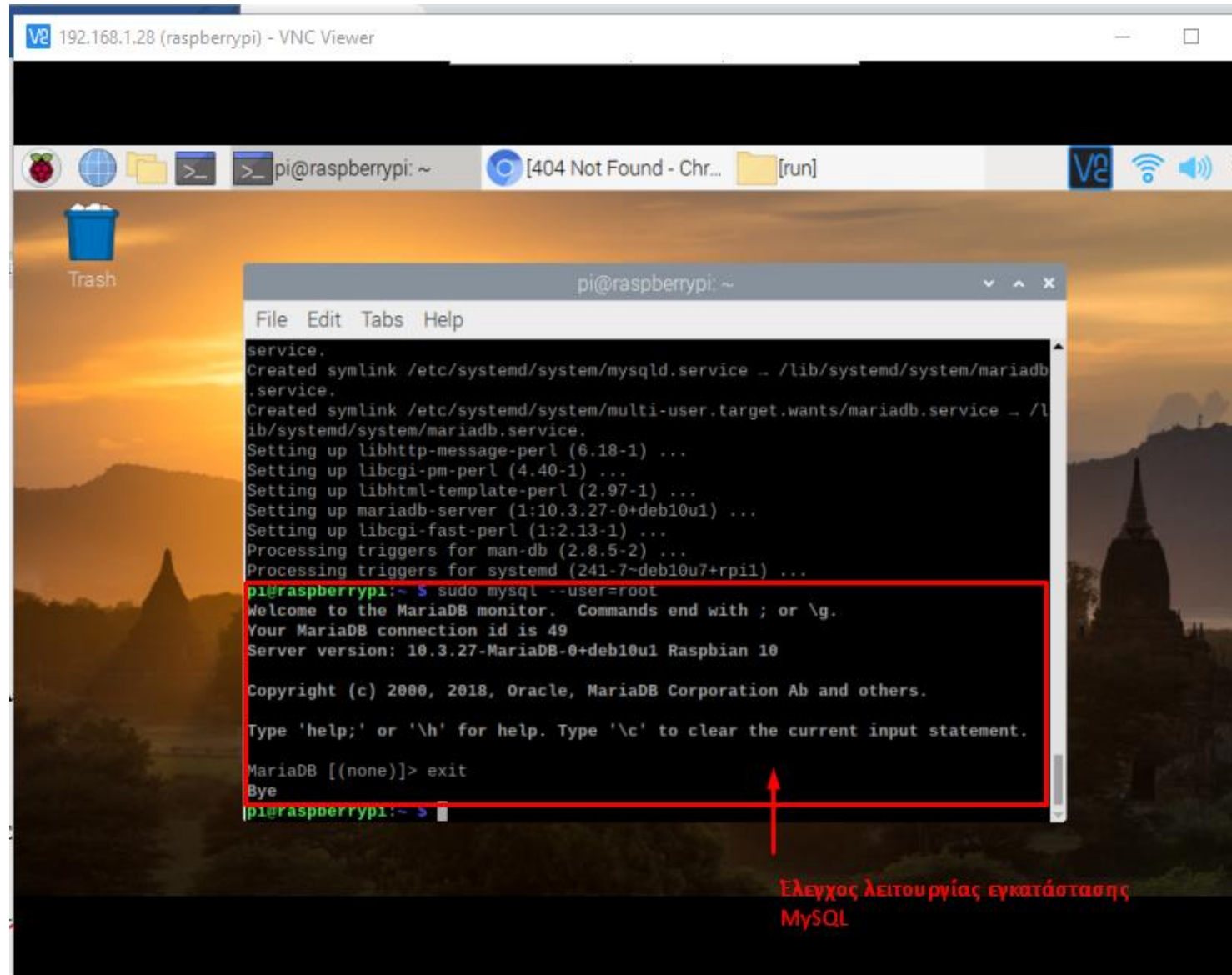


The screenshot shows a Raspberry Pi desktop environment with a sunset background. A terminal window titled 'pi@raspberrypi: ~' is open, displaying the output of a package installation command. The output lists several Perl modules being installed, including libtimedate-perl, libhttp-date-perl, libio-html-perl, liblwp-mediatypes-perl, libhttp-message-perl, libterm-readkey-perl, and mariadb-server. A red box highlights the terminal output, and a red arrow points to the text 'Install MariaDB-server' at the bottom right of the image.

```
File Edit Tabs Help
selecting previously unselected package libtimedate-perl.
Preparing to unpack .../19-libtimedate-perl_2.3000-2+deb10u1_all.deb ...
Unpacking libtimedate-perl (2.3000-2+deb10u1) ...
selecting previously unselected package libhttp-date-perl.
Preparing to unpack .../20-libhttp-date-perl_6.02-1_all.deb ...
Unpacking libhttp-date-perl (6.02-1) ...
selecting previously unselected package libio-html-perl.
Preparing to unpack .../21-libio-html-perl_1.001-1_all.deb ...
Unpacking libio-html-perl (1.001-1) ...
selecting previously unselected package liblwp-mediatypes-perl.
Preparing to unpack .../22-liblwp-mediatypes-perl_6.02-1_all.deb ...
Unpacking liblwp-mediatypes-perl (6.02-1) ...
selecting previously unselected package libhttp-message-perl.
Preparing to unpack .../23-libhttp-message-perl_6.18-1_all.deb ...
Unpacking libhttp-message-perl (6.18-1) ...
selecting previously unselected package libterm-readkey-perl.
Preparing to unpack .../24-libterm-readkey-perl_2.38-1_armhf.deb ...
Unpacking libterm-readkey-perl (2.38-1) ...
selecting previously unselected package mariadb-server.
Preparing to unpack .../25-mariadb-server_1%3a10.3.27-0+deb10u1_all.deb ...
Unpacking mariadb-server (1:10.3.27-0+deb10u1) ...
Setting up libconfig-inifiles-perl (3.000001-1) ...
Setting up libreadline5:armhf (5.2+dfsg-3) ...
```

Install MariaDB-server

Έλεγχος λειτουργίας Εγκατάστασης MySQL



192.168.1.28 (raspberrypi) - VNC Viewer

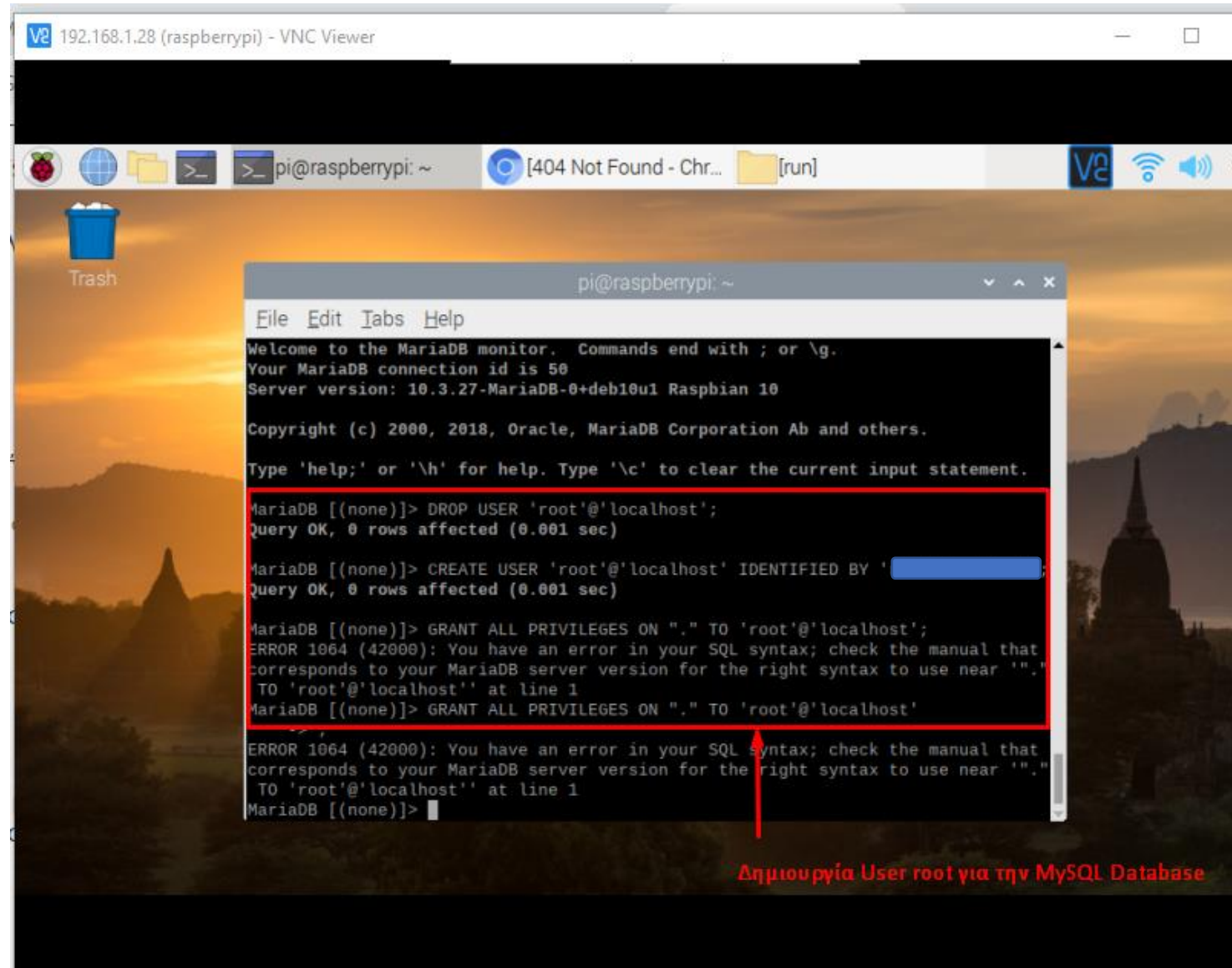
pi@raspberrypi: ~

File Edit Tabs Help

```
service.  
Created symlink /etc/systemd/system/mysql.service → /lib/systemd/system/mariadb.service.  
Created symlink /etc/systemd/system/multi-user.target.wants/mariadb.service → /lib/systemd/system/mariadb.service.  
Setting up libhttp-message-perl (6.18-1) ...  
Setting up libcgi-pm-perl (4.40-1) ...  
Setting up libhtml-template-perl (2.97-1) ...  
Setting up mariadb-server (1:10.3.27-0+deb10u1) ...  
Setting up libcgi-fast-perl (1:2.13-1) ...  
Processing triggers for man-db (2.8.5-2) ...  
Processing triggers for systemd (241-7-deb10u7+rpil) ...  
pi@raspberrypi:~$ sudo mysql --user=root  
Welcome to the MariaDB monitor.  Commands end with ; or \g.  
Your MariaDB connection id is 49  
Server version: 10.3.27-MariaDB-0+deb10u1 Raspbian 10  
  
Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.  
  
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.  
MariaDB [(none)]> exit  
Bye  
pi@raspberrypi:~$
```

Έλεγχος λειτουργίας εγκατάστασης MySQL

Δημιουργία Χρήστη με δικαιώματα Διαχειριστή στη Βάση Δεδομένων



The screenshot shows a Raspberry Pi desktop environment with a sunset background. A terminal window titled 'pi@raspberrypi: ~' is open, displaying the MariaDB monitor interface. The terminal shows the following commands and output:

```
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 50
Server version: 10.3.27-MariaDB-0+deb10u1 Raspbian 10

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

MariaDB [(none)]> DROP USER 'root'@'localhost';
Query OK, 0 rows affected (0.001 sec)

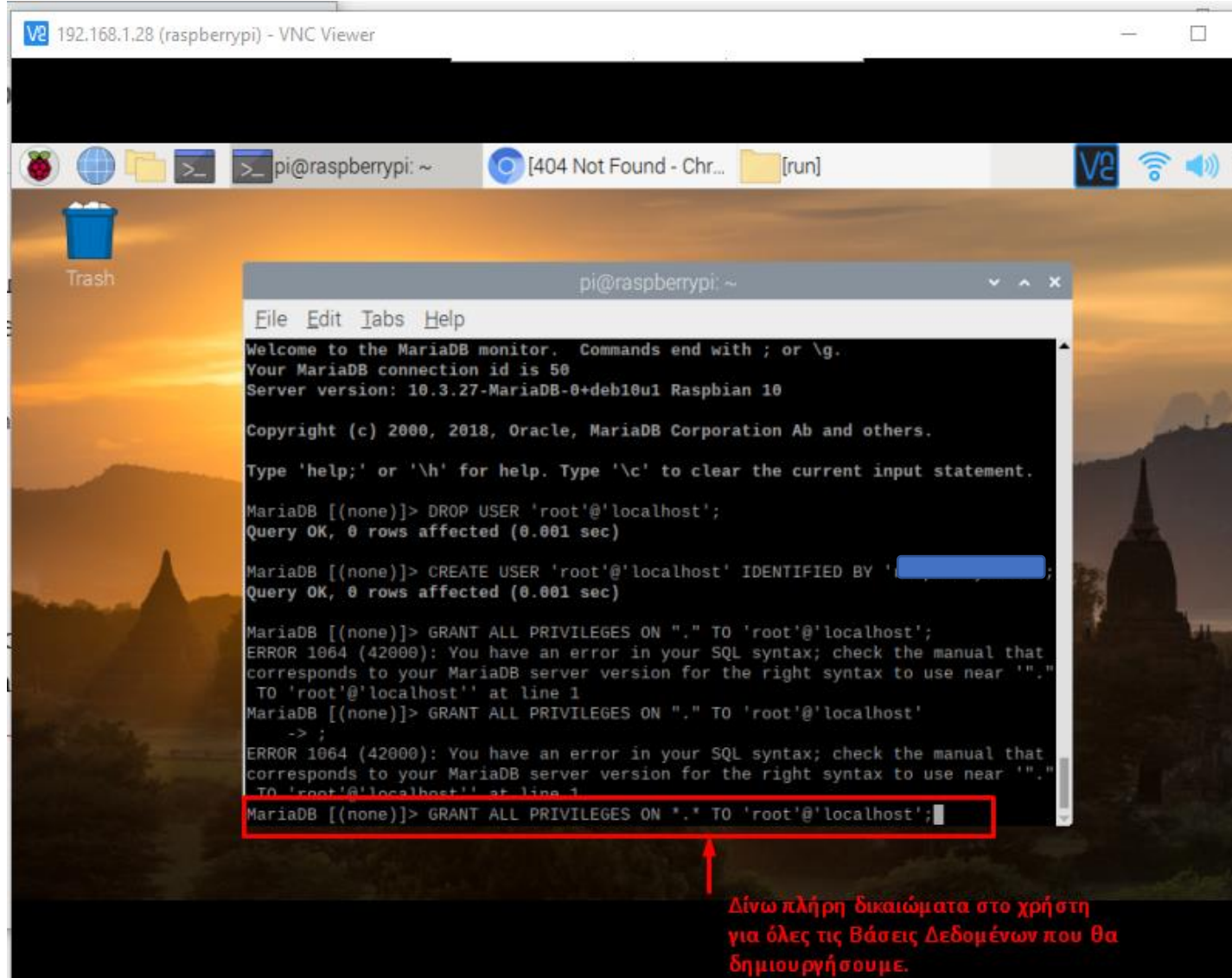
MariaDB [(none)]> CREATE USER 'root'@'localhost' IDENTIFIED BY ' ';
Query OK, 0 rows affected (0.001 sec)

MariaDB [(none)]> GRANT ALL PRIVILEGES ON "." TO 'root'@'localhost';
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that
corresponds to your MariaDB server version for the right syntax to use near '."'
TO 'root'@'localhost'' at line 1
MariaDB [(none)]> GRANT ALL PRIVILEGES ON "." TO 'root'@'localhost'
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that
corresponds to your MariaDB server version for the right syntax to use near '."'
TO 'root'@'localhost'' at line 1
MariaDB [(none)]>
```

A red box highlights the commands from 'CREATE USER' to the first 'GRANT' command. A red arrow points to the second 'GRANT' command. The desktop includes a 'Trash' icon and a taskbar with a terminal icon, a browser showing a 404 error, and a folder named 'run'.

Δημιουργία User root για την MySQL Database

Πλήρη Δικαιώματα στο Χρήστη του MySQL Server



192.168.1.28 (raspberrypi) - VNC Viewer

pi@raspberrypi: ~ [404 Not Found - Chr... [run]

Trash

```
File Edit Tabs Help
Welcome to the MariaDB monitor.  Commands end with ; or \g.
Your MariaDB connection id is 50
Server version: 10.3.27-MariaDB-0+deb10u1 Raspbian 10

Copyright (c) 2000, 2018, Oracle, MariaDB Corporation Ab and others.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

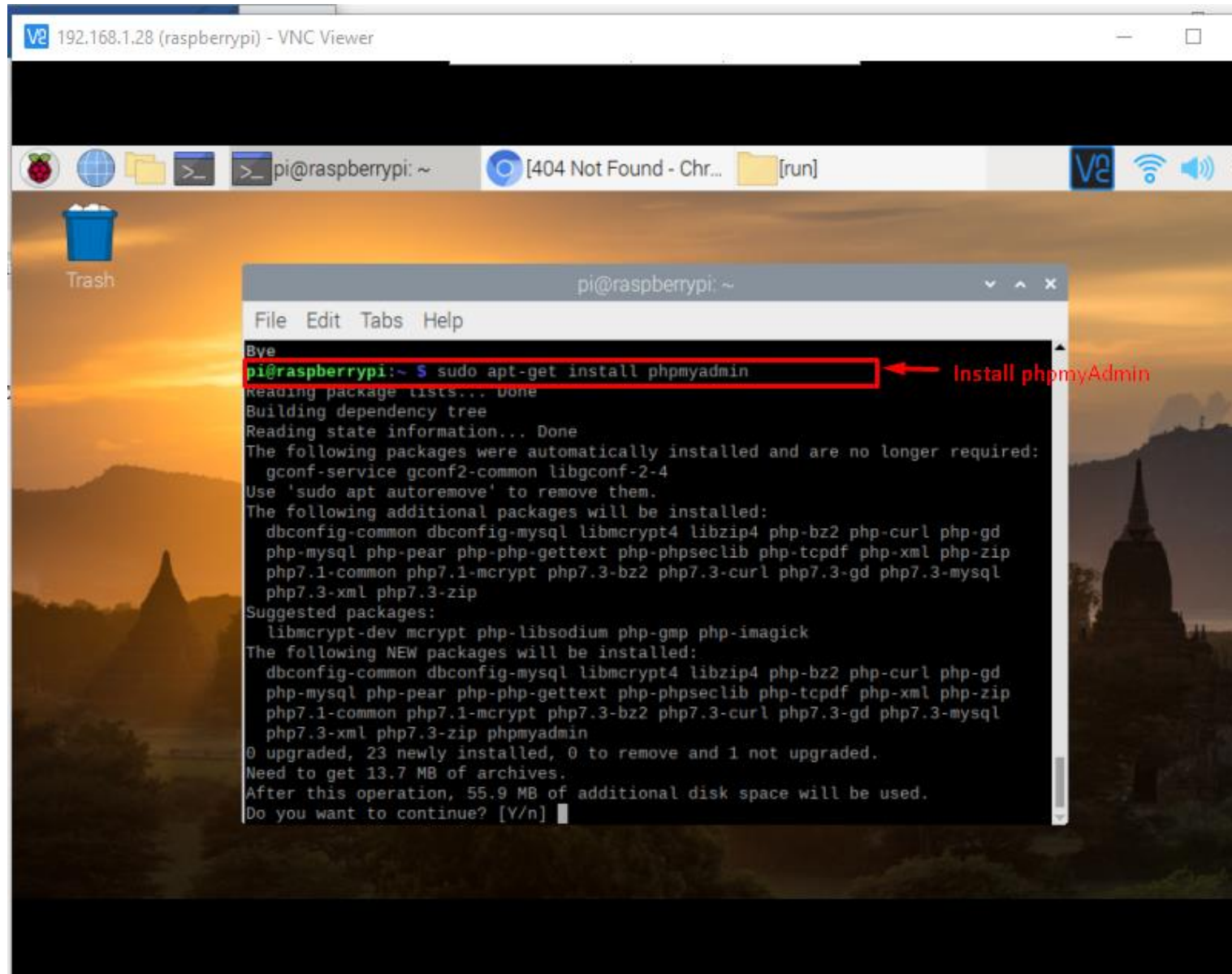
MariaDB [(none)]> DROP USER 'root'@'localhost';
Query OK, 0 rows affected (0.001 sec)

MariaDB [(none)]> CREATE USER 'root'@'localhost' IDENTIFIED BY ' ';
Query OK, 0 rows affected (0.001 sec)

MariaDB [(none)]> GRANT ALL PRIVILEGES ON "." TO 'root'@'localhost';
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that
corresponds to your MariaDB server version for the right syntax to use near '."'
TO 'root'@'localhost'' at line 1
MariaDB [(none)]> GRANT ALL PRIVILEGES ON "." TO 'root'@'localhost'
-> ;
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that
corresponds to your MariaDB server version for the right syntax to use near '."'
TO 'root'@'localhost'' at line 1
MariaDB [(none)]> GRANT ALL PRIVILEGES ON *.* TO 'root'@'localhost';
```

Δίνω πλήρη δικαιώματα στο χρήστη για όλες τις βάσεις δεδομένων που θα δημιουργήσουμε.

Εγκατάσταση του PHPmyAdmin



The screenshot shows a Raspberry Pi desktop environment with a sunset background. A terminal window is open, displaying the command to install PHPmyAdmin. The command is highlighted with a red box, and a red arrow points to it with the text "Install phpmyAdmin".

```
pi@raspberrypi: ~  
File Edit Tabs Help  
Bye  
pi@raspberrypi:~ $ sudo apt-get install phpmyadmin  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
The following packages were automatically installed and are no longer required:  
  gconf-service gconf2-common libgconf-2-4  
Use 'sudo apt autoremove' to remove them.  
The following additional packages will be installed:  
  dbconfig-common dbconfig-mysql libmcrypt4 libzip4 php-bz2 php-curl php-gd  
  php-mysql php-pear php-php-gettext php-phpseclib php-tcpdf php-xml php-zip  
  php7.1-common php7.1-mcrypt php7.3-bz2 php7.3-curl php7.3-gd php7.3-mysql  
  php7.3-xml php7.3-zip  
Suggested packages:  
  libmcrypt-dev mcrypt php-libsodium php-gmp php-imagick  
The following NEW packages will be installed:  
  dbconfig-common dbconfig-mysql libmcrypt4 libzip4 php-bz2 php-curl php-gd  
  php-mysql php-pear php-php-gettext php-phpseclib php-tcpdf php-xml php-zip  
  php7.1-common php7.1-mcrypt php7.3-bz2 php7.3-curl php7.3-gd php7.3-mysql  
  php7.3-xml php7.3-zip phpmyadmin  
0 upgraded, 23 newly installed, 0 to remove and 1 not upgraded.  
Need to get 13.7 MB of archives.  
After this operation, 55.9 MB of additional disk space will be used.  
Do you want to continue? [Y/n]
```

Ρυθμίσεις του αρχείου apache.conf

V2 192.168.1.28 (raspberrypi) - VNC Viewer

phpMyAdmin - Chro... phpmyadmin pi@raspberrypi: ~

phpMyAdmin x +

http://127.0.0.1/phpmyadmin/index

File Edit Tabs Help

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement

```
MariaDB [(none)]> show databases;
+-----+
| Database |
+-----+
| information_schema |
| mysql |
| performance_schema |
+-----+
3 rows in set (0.001 sec)

MariaDB [(none)]> CREATE USER 'espepal'@'localhost' IDENTIFIED BY 'espepal20';
Query OK, 0 rows affected (0.001 sec)

MariaDB [(none)]> GRANT ALL PRIVILEGES ON *.* TO 'espepal'@'localhost';
ERROR 1045 (28000): Access denied for user 'root'@'localhost' (using password YES)

MariaDB [(none)]> quit
Bye
pi@raspberrypi:~$ sudo ln -s /usr/share/phpmyadmin /var/www/html/phpmyadmin
pi@raspberrypi:~$ sudo nano /etc/apache2/apache2.conf
pi@raspberrypi:~$ sudo service apache2 restart
pi@raspberrypi:~$
```

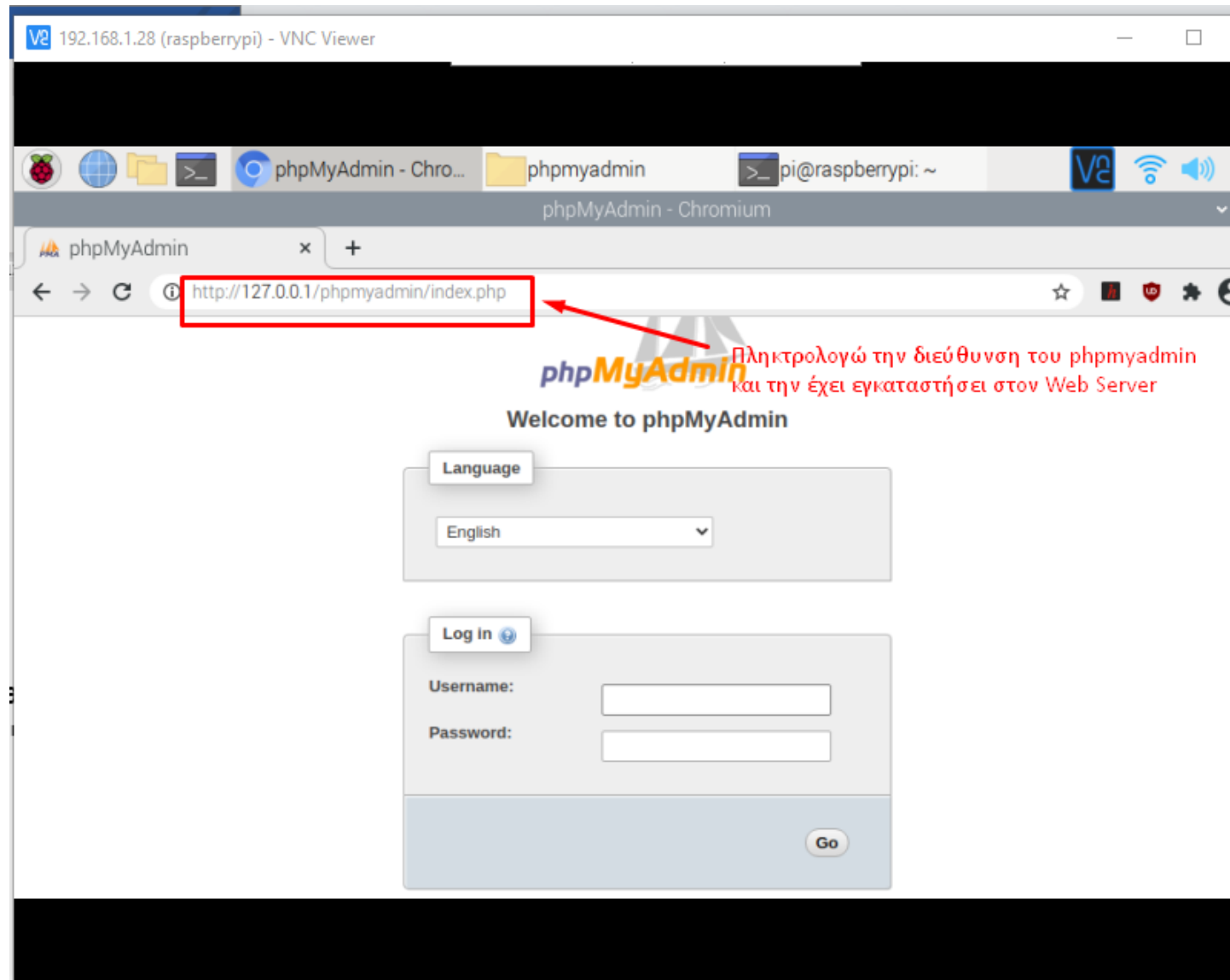
Log In

Username: phpmyadmin

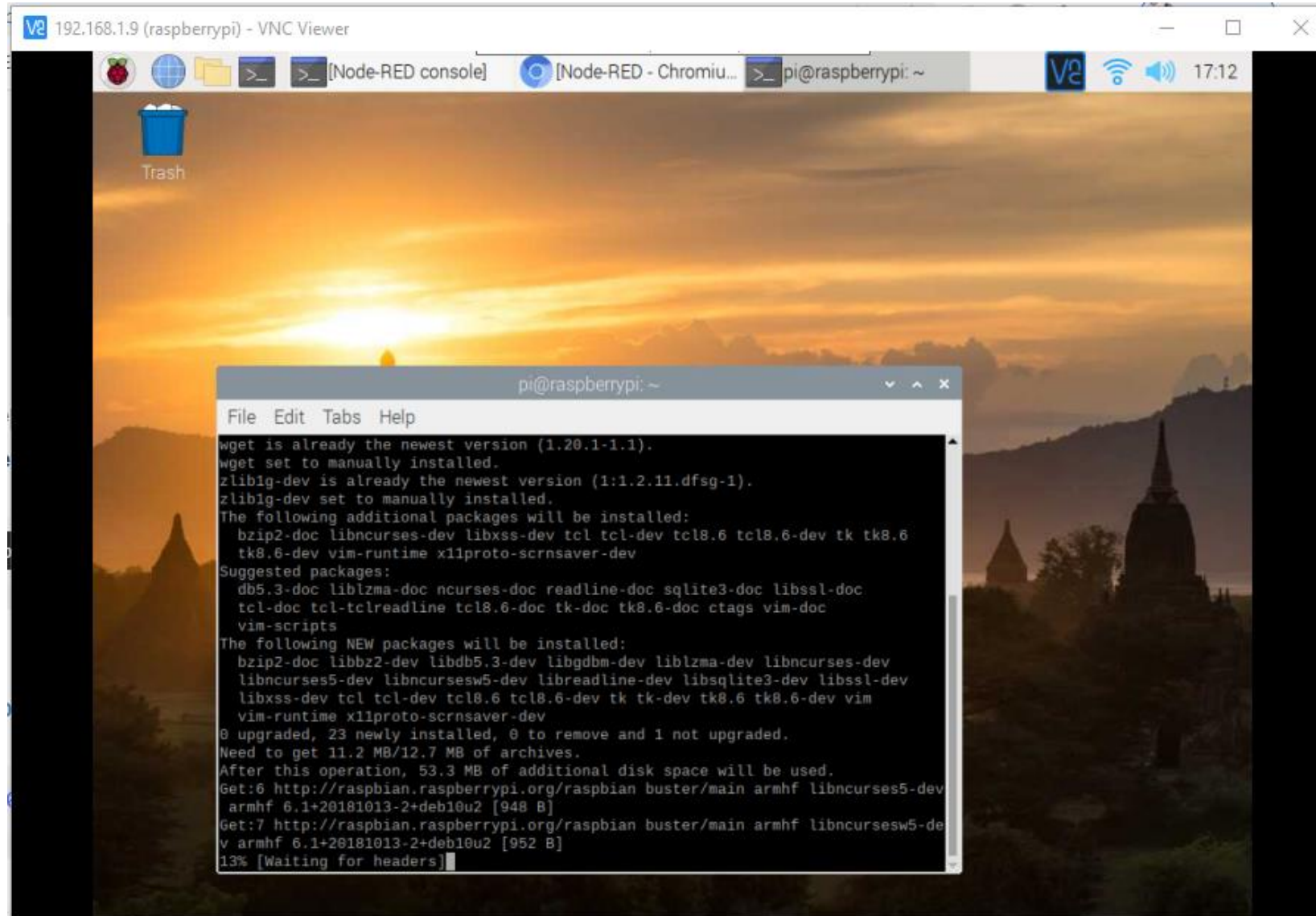
Password:

Apache2.conf
Συμπληρώσαμε στο τέλος του εγγράφου την εξής γραμμή
Include /etc/phpmyadmin/apache.conf

Μπαίνω στον phpMyAdmin από τον Browser



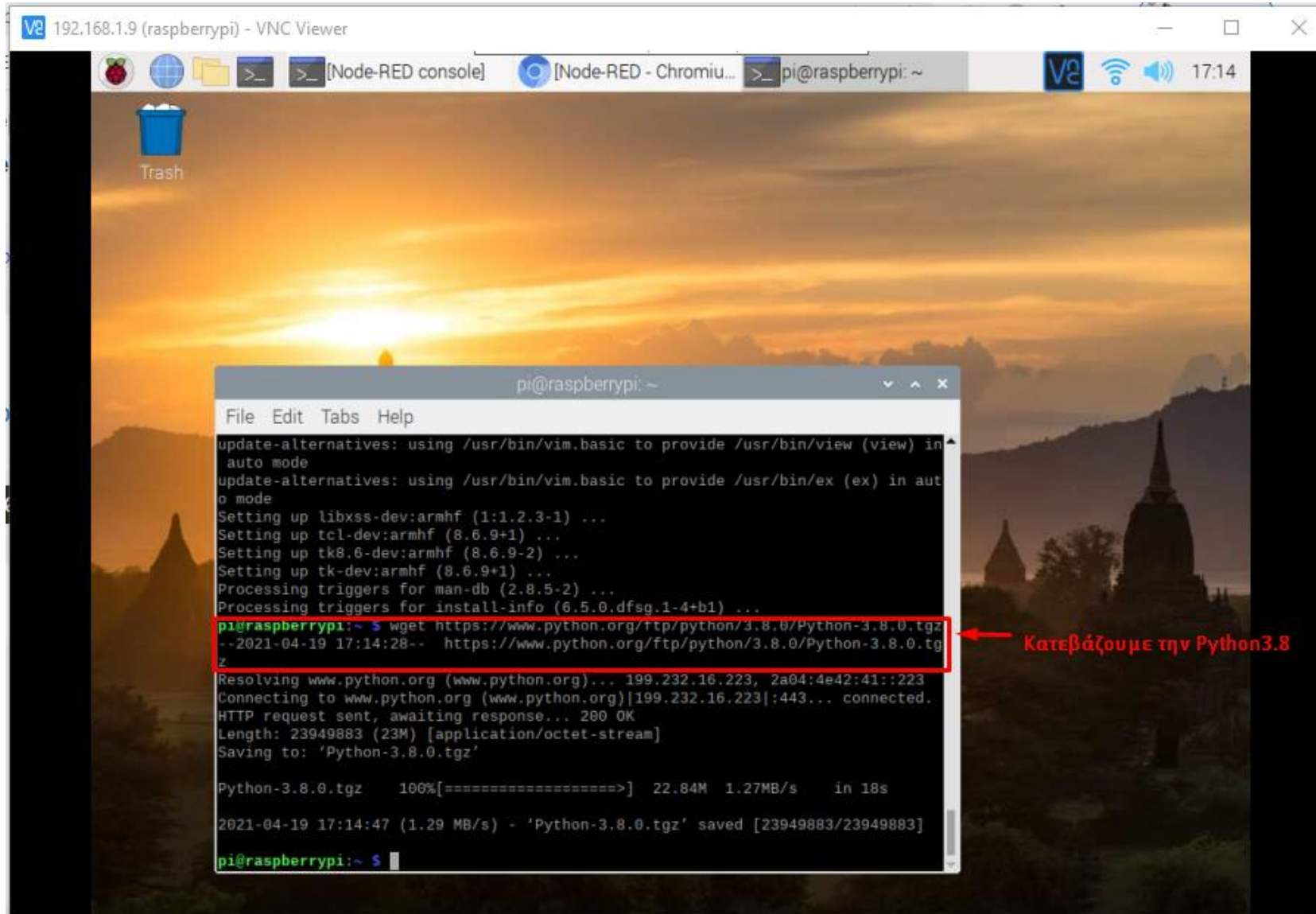
Preinstall Python



The screenshot shows a Raspberry Pi desktop environment accessed via VNC. The desktop background is a sunset over a landscape with pagodas. A terminal window titled 'pi@raspberrypi: ~' is open, displaying the output of a package management command. The output indicates that 'wget' and 'zlib1g-dev' are already installed, and lists additional packages to be installed along with their disk space requirements.

```
pi@raspberrypi: ~  
File Edit Tabs Help  
wget is already the newest version (1.20.1-1.1).  
wget set to manually installed.  
zlib1g-dev is already the newest version (1:1.2.11.dfsg-1).  
zlib1g-dev set to manually installed.  
The following additional packages will be installed:  
  bzip2-doc libncurses-dev libxss-dev tcl tcl-dev tcl8.6 tcl8.6-dev tk tk8.6  
  tk8.6-dev vim-runtime x11proto-scrnsaver-dev  
Suggested packages:  
  db5.3-doc liblzma-doc ncurses-doc readline-doc sqlite3-doc libssl-doc  
  tcl-doc tcl-tclreadline tcl8.6-doc tk-doc tk8.6-doc ctags vim-doc  
  vim-scripts  
The following NEW packages will be installed:  
  bzip2-doc libbz2-dev libdb5.3-dev libgdbm-dev liblzma-dev libncurses-dev  
  libncurses5-dev libncursesw5-dev libreadline-dev libsqlite3-dev libssl-dev  
  libxss-dev tcl tcl-dev tcl8.6 tcl8.6-dev tk tk-dev tk8.6 tk8.6-dev vim  
  vim-runtime x11proto-scrnsaver-dev  
0 upgraded, 23 newly installed, 0 to remove and 1 not upgraded.  
Need to get 11.2 MB/12.7 MB of archives.  
After this operation, 53.3 MB of additional disk space will be used.  
Get:6 http://raspbian.raspberrypi.org/raspbian buster/main armhf libncurses5-dev  
armhf 6.1+20181013-2+deb10u2 [948 B]  
Get:7 http://raspbian.raspberrypi.org/raspbian buster/main armhf libncursesw5-de  
v armhf 6.1+20181013-2+deb10u2 [952 B]  
13% [Waiting for headers]
```

Download Python 3.8



192.168.1.9 (raspberrypi) - VNC Viewer

Trash

pi@raspberrypi: ~

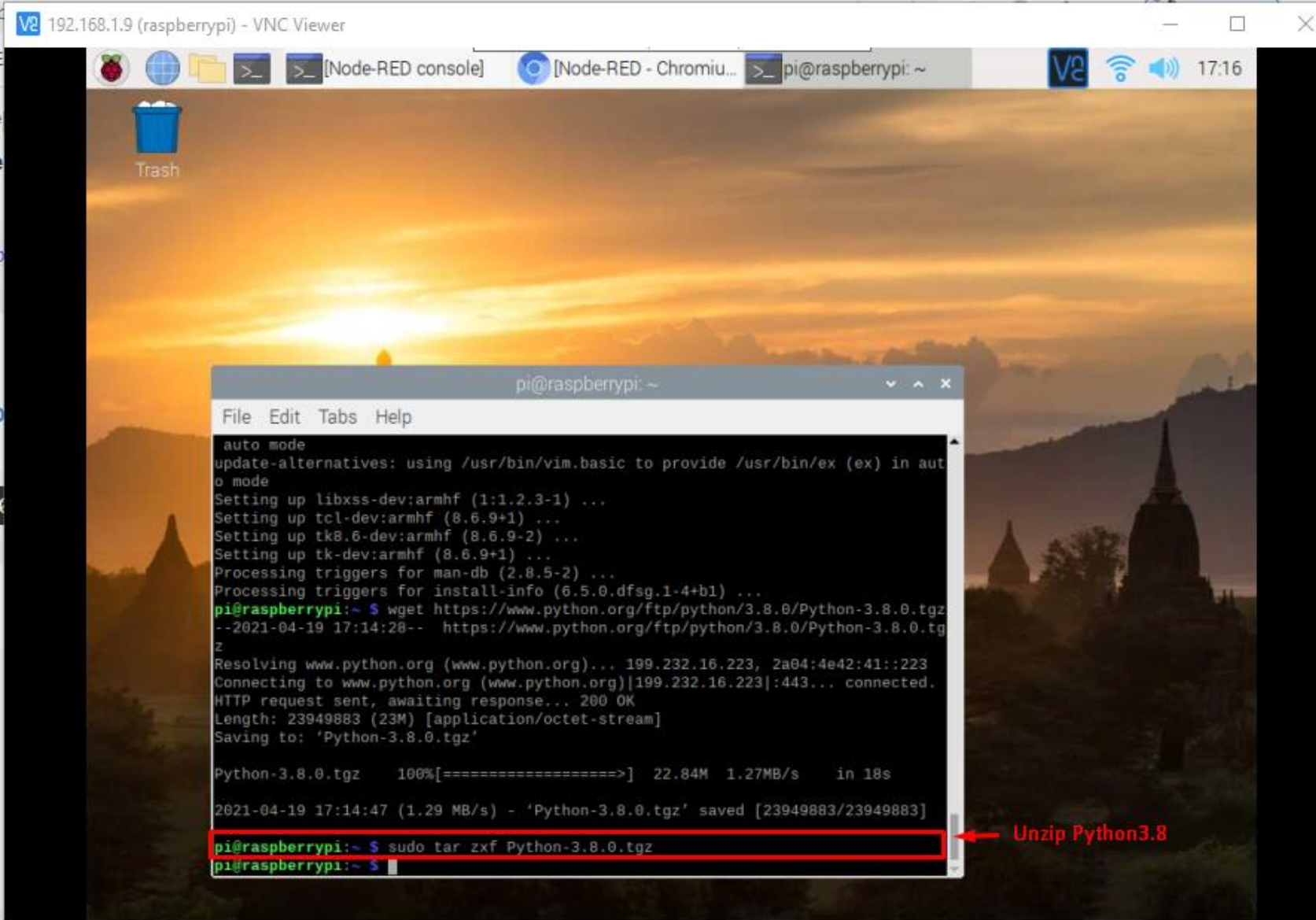
```
File Edit Tabs Help
update-alternatives: using /usr/bin/vim.basic to provide /usr/bin/view (view) in
auto mode
update-alternatives: using /usr/bin/vim.basic to provide /usr/bin/ex (ex) in aut
o mode
Setting up libxss-dev:armhf (1:1.2.3-1) ...
Setting up tcl-dev:armhf (8.6.9+1) ...
Setting up tk8.6-dev:armhf (8.6.9-2) ...
Setting up tk-dev:armhf (8.6.9+1) ...
Processing triggers for man-db (2.8.5-2) ...
Processing triggers for install-info (6.5.0.dfsg.1-4+b1) ...
pi@raspberrypi:~ $ wget https://www.python.org/ftp/python/3.8.0/Python-3.8.0.tgz
--2021-04-19 17:14:28-- https://www.python.org/ftp/python/3.8.0/Python-3.8.0.tgz
Resolving www.python.org (www.python.org)... 199.232.16.223, 2a04:4e42:41::223
Connecting to www.python.org (www.python.org)[199.232.16.223]:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 23949883 (23M) [application/octet-stream]
Saving to: 'Python-3.8.0.tgz'

Python-3.8.0.tgz  100%[=====] 22.84M  1.27MB/s  in 18s
2021-04-19 17:14:47 (1.29 MB/s) - 'Python-3.8.0.tgz' saved [23949883/23949883]

pi@raspberrypi:~ $
```

Κατεβάζουμε την Python 3.8

Unzip Python 3.8

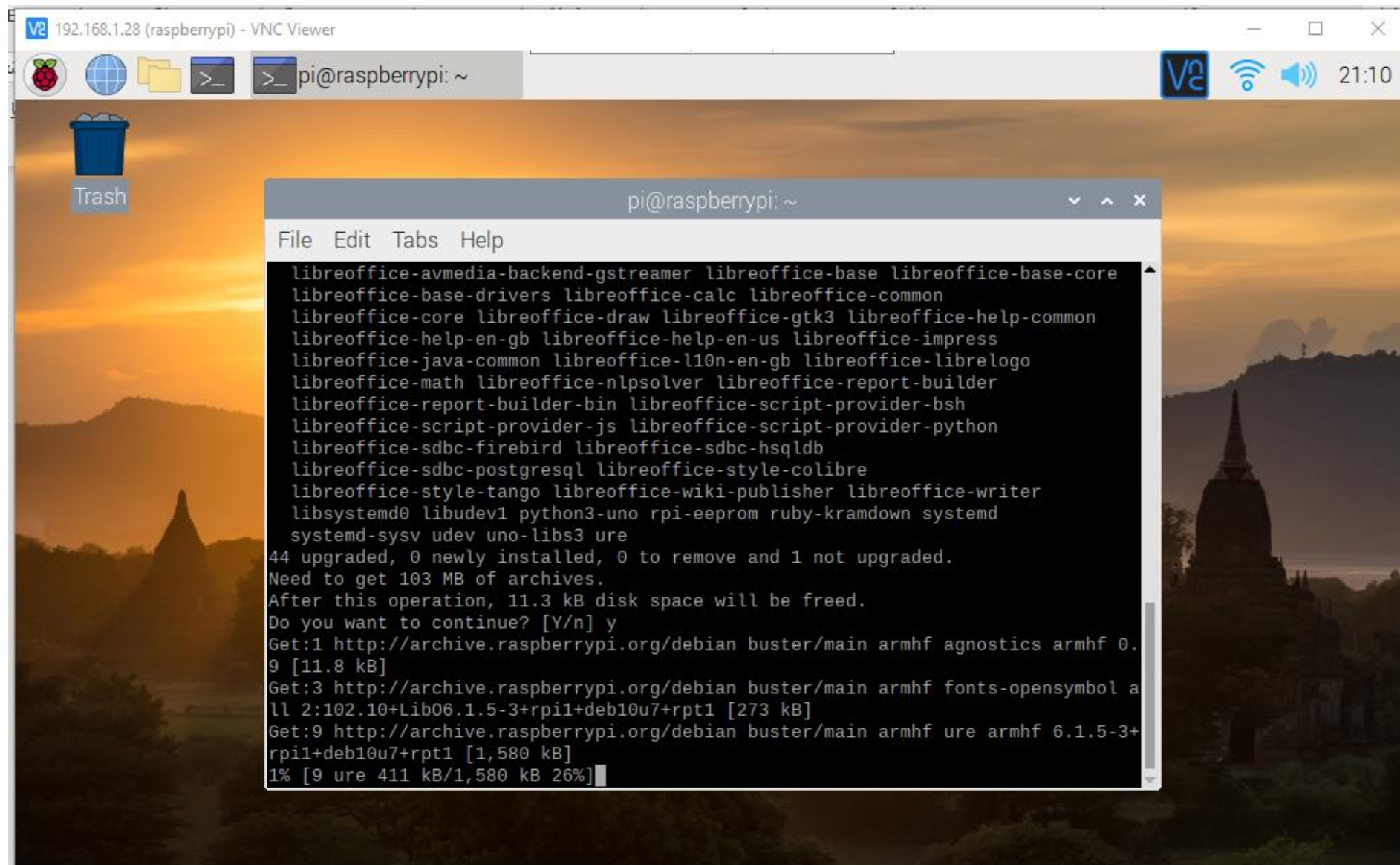


The screenshot shows a Raspberry Pi desktop environment viewed through a VNC viewer. The desktop background is a sunset over a landscape with pagodas. A terminal window is open in the foreground, displaying the output of a series of commands. The terminal window has a title bar that reads "pi@raspberrypi: ~". The output shows the installation of various development packages and the successful download of the Python 3.8.0 source code. The command to unzip the file is highlighted with a red box, and a red arrow points to it with the text "Unzip Python3.8".

```
pi@raspberrypi: ~  
File Edit Tabs Help  
auto mode  
update-alternatives: using /usr/bin/vim.basic to provide /usr/bin/ex (ex) in aut  
o mode  
Setting up libxss-dev:armhf (1:1.2.3-1) ...  
Setting up tcl-dev:armhf (8.6.9+1) ...  
Setting up tk8.6-dev:armhf (8.6.9-2) ...  
Setting up tk-dev:armhf (8.6.9+1) ...  
Processing triggers for man-db (2.8.5-2) ...  
Processing triggers for install-info (6.5.0.dfsg.1-4+b1) ...  
pi@raspberrypi:~$ wget https://www.python.org/ftp/python/3.8.0/Python-3.8.0.tgz  
--2021-04-19 17:14:28-- https://www.python.org/ftp/python/3.8.0/Python-3.8.0.tg  
z  
Resolving www.python.org (www.python.org)... 199.232.16.223, 2a04:4e42:41::223  
Connecting to www.python.org (www.python.org)[199.232.16.223]:443... connected.  
HTTP request sent, awaiting response... 200 OK  
Length: 23949883 (23M) [application/octet-stream]  
Saving to: 'Python-3.8.0.tgz'  
  
Python-3.8.0.tgz 100%[=====>] 22.84M 1.27MB/s in 18s  
  
2021-04-19 17:14:47 (1.29 MB/s) - 'Python-3.8.0.tgz' saved [23949883/23949883]  
pi@raspberrypi:~$ sudo tar xzf Python-3.8.0.tgz  
pi@raspberrypi:~$
```

Unzip Python3.8

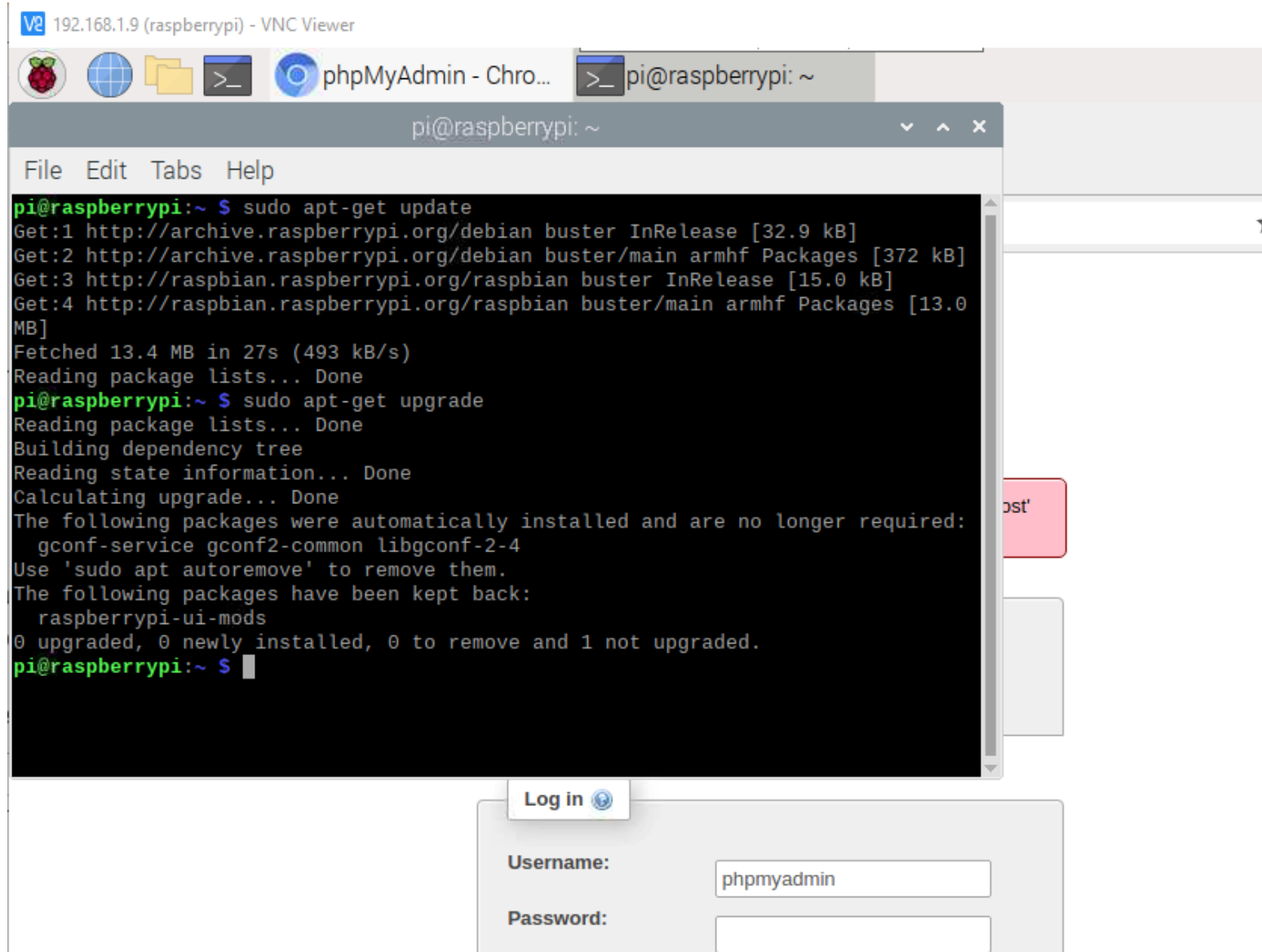
Update το Λειτουργικό Σύστημα



The screenshot shows a Raspberry Pi desktop environment. The background is a sunset over a landscape with a pagoda. A terminal window is open, displaying the output of the 'sudo apt update' command. The terminal window has a title bar that reads 'pi@raspberrypi: ~'. The output of the command lists various packages to be upgraded, including libreoffice-avmedia-backend-gstreamer, libreoffice-base, libreoffice-base-core, libreoffice-base-drivers, libreoffice-calc, libreoffice-common, libreoffice-core, libreoffice-draw, libreoffice-gtk3, libreoffice-help-common, libreoffice-help-en-gb, libreoffice-help-en-us, libreoffice-impress, libreoffice-java-common, libreoffice-l10n-en-gb, libreoffice-librelogo, libreoffice-math, libreoffice-nlpsolver, libreoffice-report-builder, libreoffice-report-builder-bin, libreoffice-script-provider-bsh, libreoffice-script-provider-js, libreoffice-script-provider-python, libreoffice-sdbc-firebird, libreoffice-sdbc-hsqldb, libreoffice-sdbc-postgresql, libreoffice-style-colibre, libreoffice-style-tango, libreoffice-wiki-publisher, libreoffice-writer, libsystemd0, libudev1, python3-uno, rpi-eeeprom, ruby-kramdown, systemd, systemd-sysv, udev, uno-libs3, and ure. The output also indicates that 44 packages are upgraded, 0 are newly installed, 0 are to be removed, and 1 is not upgraded. The need to get 103 MB of archives is shown, and the disk space freed after the operation is 11.3 kB. The command prompt is at the end of the line, indicating the update process is ongoing.

```
pi@raspberrypi: ~  
File Edit Tabs Help  
libreoffice-avmedia-backend-gstreamer libreoffice-base libreoffice-base-core  
libreoffice-base-drivers libreoffice-calc libreoffice-common  
libreoffice-core libreoffice-draw libreoffice-gtk3 libreoffice-help-common  
libreoffice-help-en-gb libreoffice-help-en-us libreoffice-impress  
libreoffice-java-common libreoffice-l10n-en-gb libreoffice-librelogo  
libreoffice-math libreoffice-nlpsolver libreoffice-report-builder  
libreoffice-report-builder-bin libreoffice-script-provider-bsh  
libreoffice-script-provider-js libreoffice-script-provider-python  
libreoffice-sdbc-firebird libreoffice-sdbc-hsqldb  
libreoffice-sdbc-postgresql libreoffice-style-colibre  
libreoffice-style-tango libreoffice-wiki-publisher libreoffice-writer  
libsystemd0 libudev1 python3-uno rpi-eeeprom ruby-kramdown systemd  
systemd-sysv udev uno-libs3 ure  
44 upgraded, 0 newly installed, 0 to remove and 1 not upgraded.  
Need to get 103 MB of archives.  
After this operation, 11.3 kB disk space will be freed.  
Do you want to continue? [Y/n] y  
Get:1 http://archive.raspberrypi.org/debian buster/main armhf agnostics armhf 0.  
9 [11.8 kB]  
Get:3 http://archive.raspberrypi.org/debian buster/main armhf fonts-opensymbol a  
ll 2:102.10+Lib06.1.5-3+rpi1+deb10u7+rpt1 [273 kB]  
Get:9 http://archive.raspberrypi.org/debian buster/main armhf ure armhf 6.1.5-3+  
rpi1+deb10u7+rpt1 [1,580 kB]  
1% [9 ure 411 kB/1,580 kB 26%]
```


Update το Λειτουργικό Σύστημα

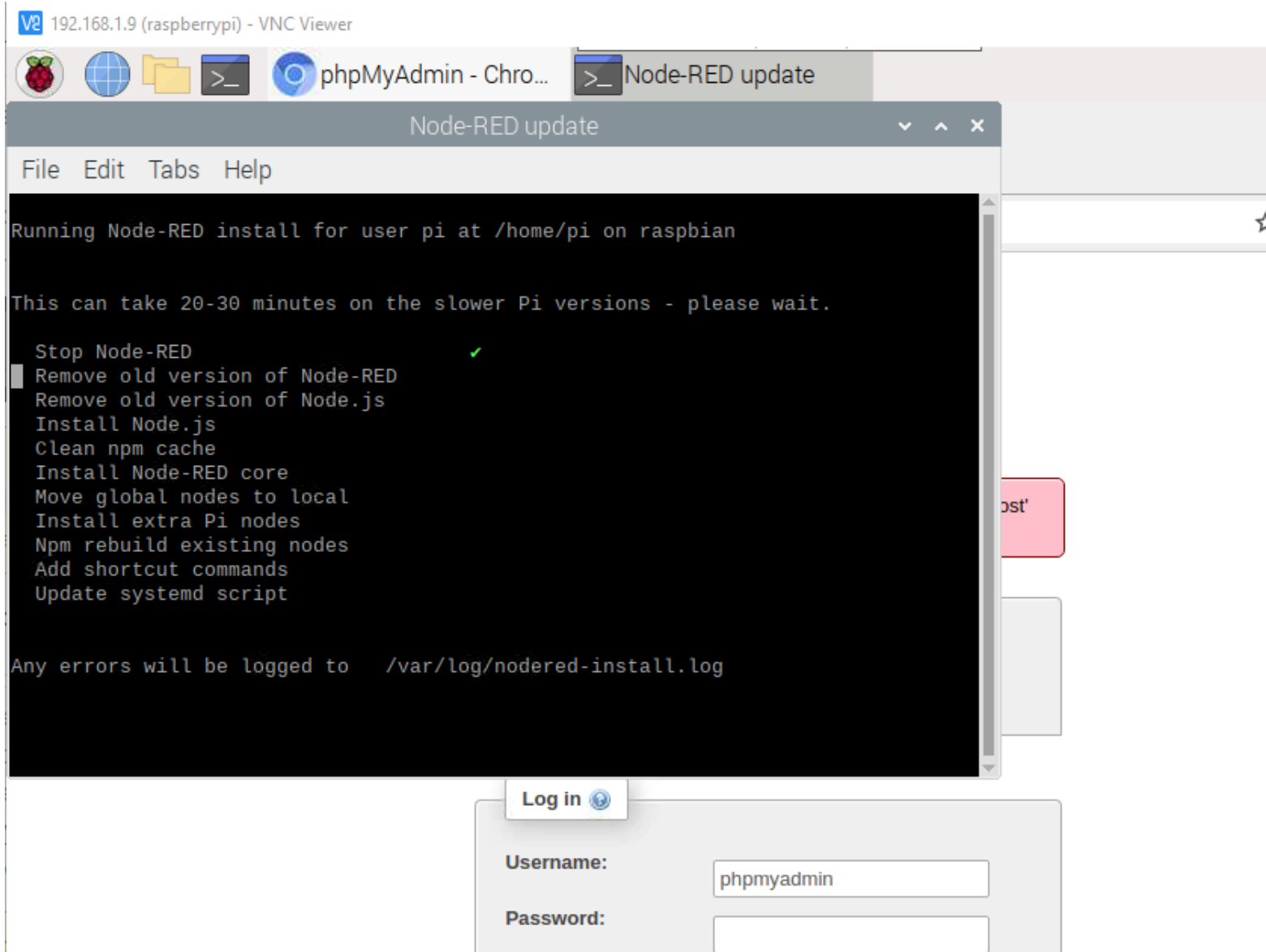


The screenshot shows a terminal window titled 'pi@raspberrypi: ~' with a menu bar containing 'File', 'Edit', 'Tabs', and 'Help'. The terminal output shows the execution of 'sudo apt-get update' and 'sudo apt-get upgrade'. The update process fetches data from various sources, including the Raspberry Pi archive and Raspbian repositories. The upgrade process identifies packages that are no longer required and packages that have been kept back. The terminal output is as follows:

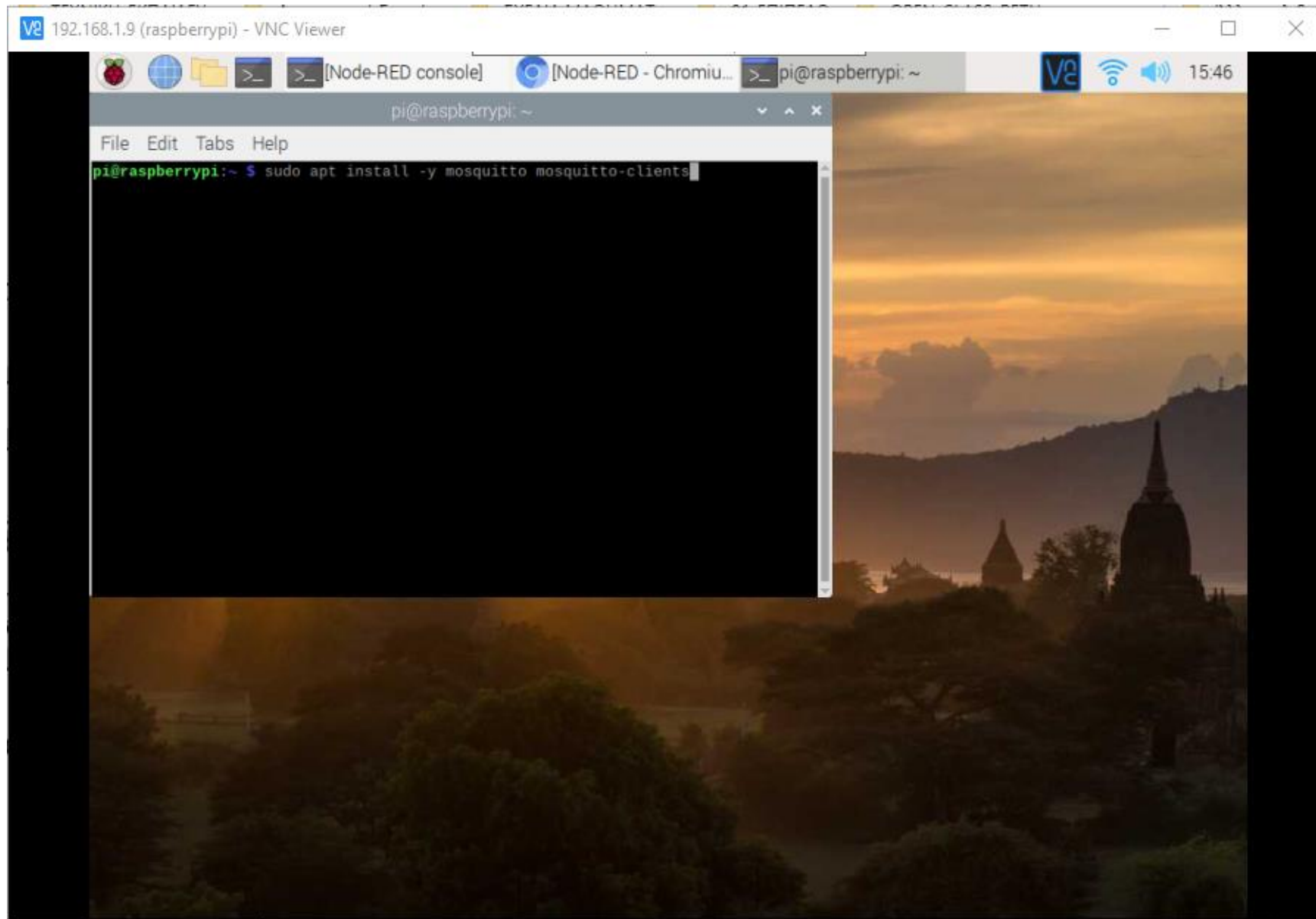
```
pi@raspberrypi:~ $ sudo apt-get update
Get:1 http://archive.raspberrypi.org/debian buster InRelease [32.9 kB]
Get:2 http://archive.raspberrypi.org/debian buster/main armhf Packages [372 kB]
Get:3 http://raspbian.raspberrypi.org/raspbian buster InRelease [15.0 kB]
Get:4 http://raspbian.raspberrypi.org/raspbian buster/main armhf Packages [13.0 MB]
Fetched 13.4 MB in 27s (493 kB/s)
Reading package lists... Done
pi@raspberrypi:~ $ sudo apt-get upgrade
Reading package lists... Done
Building dependency tree
Reading state information... Done
Calculating upgrade... Done
The following packages were automatically installed and are no longer required:
  gconf-service gconf2-common libgconf-2-4
Use 'sudo apt autoremove' to remove them.
The following packages have been kept back:
  raspberrypi-ui-mods
0 upgraded, 0 newly installed, 0 to remove and 1 not upgraded.
pi@raspberrypi:~ $
```

Below the terminal window, there is a 'Log in' button and a login form with fields for 'Username:' (containing 'phpmyadmin') and 'Password:'.

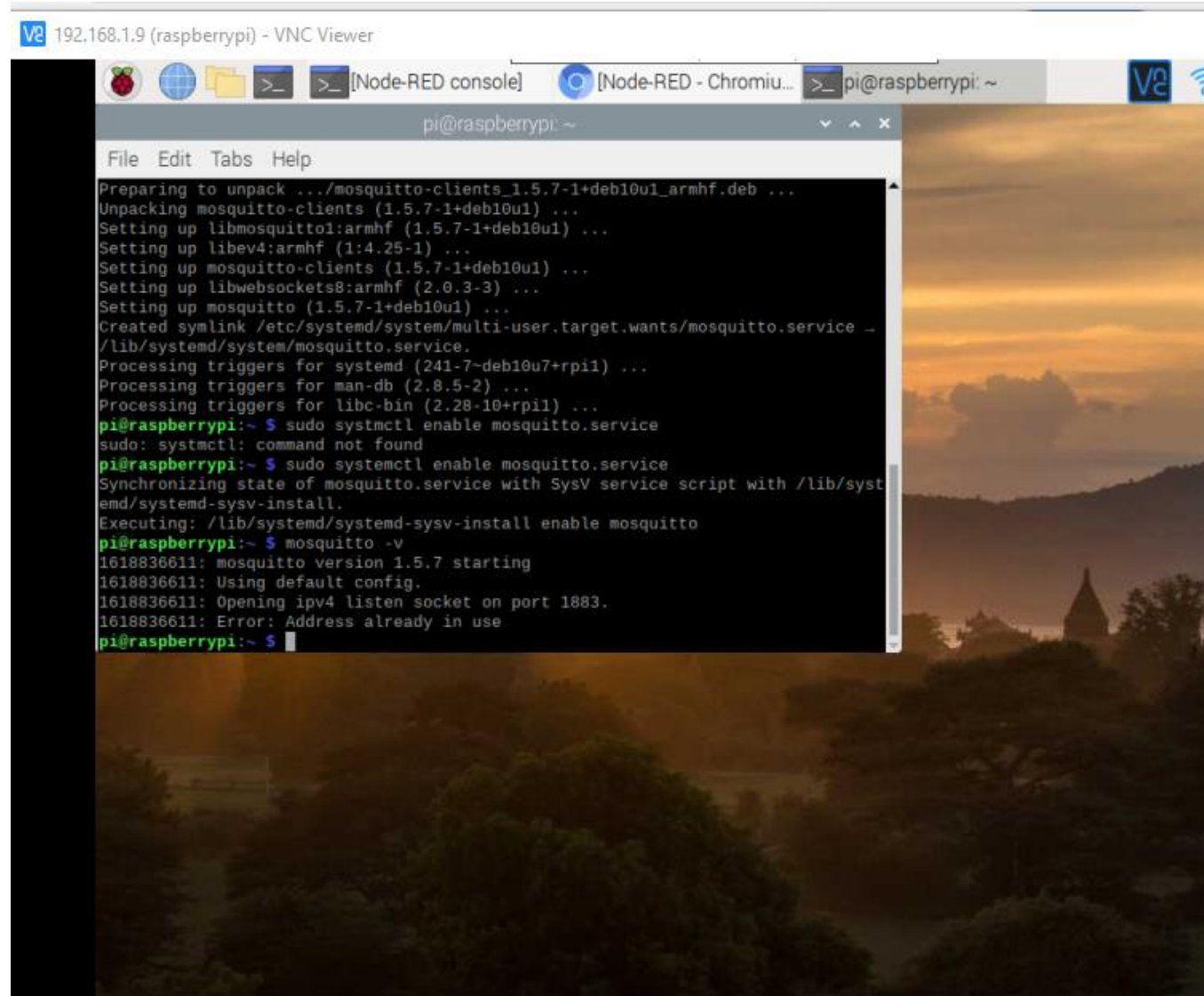
Install and Start Node-RED



Install Mosquitto



Start Mosquitto ως Υπηρεσία

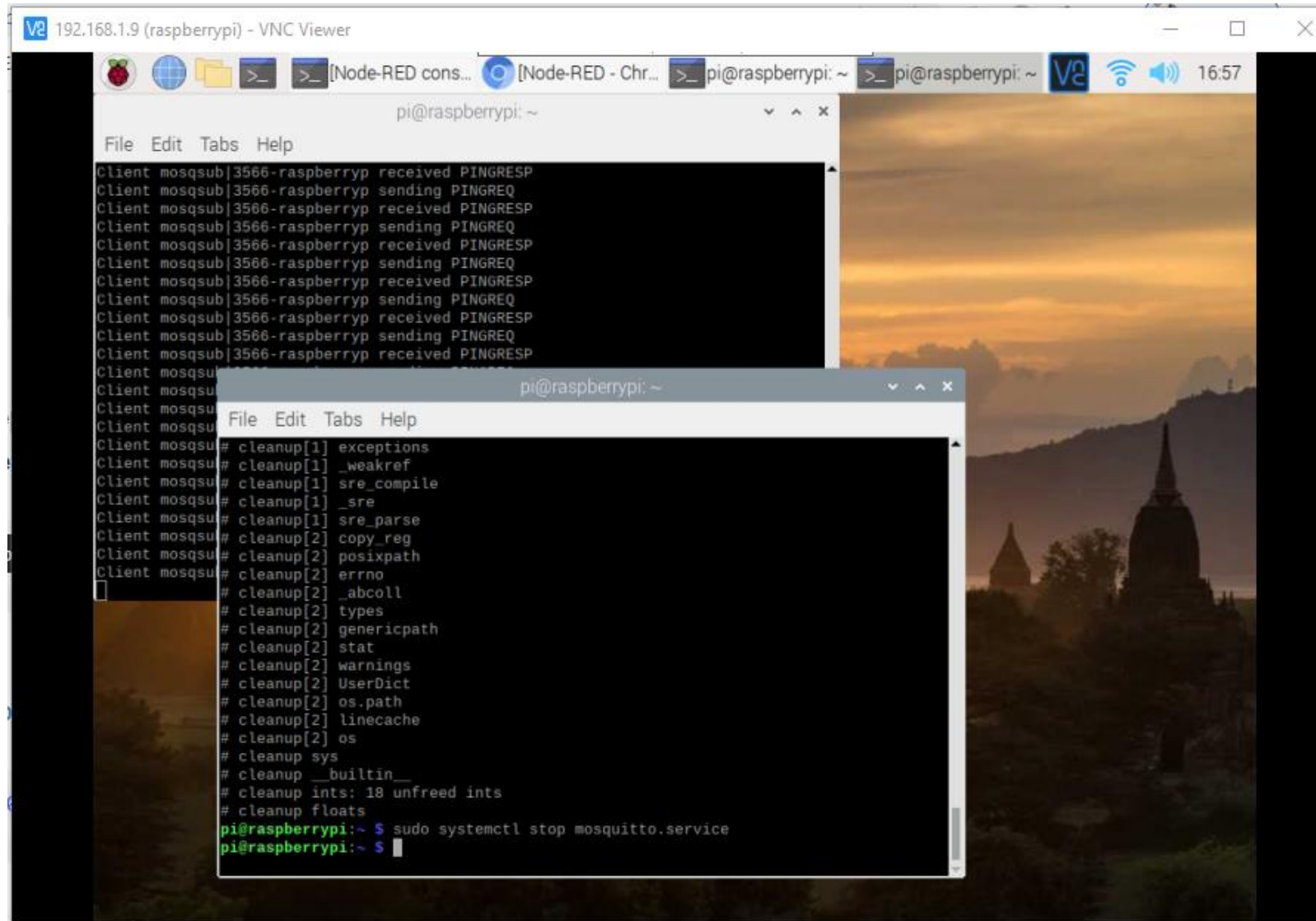


The screenshot shows a terminal window on a Raspberry Pi. The window title is "192.168.1.9 (raspberrypi) - VNC Viewer". The terminal output shows the installation of Mosquitto and the configuration of the service. The user runs the following commands:

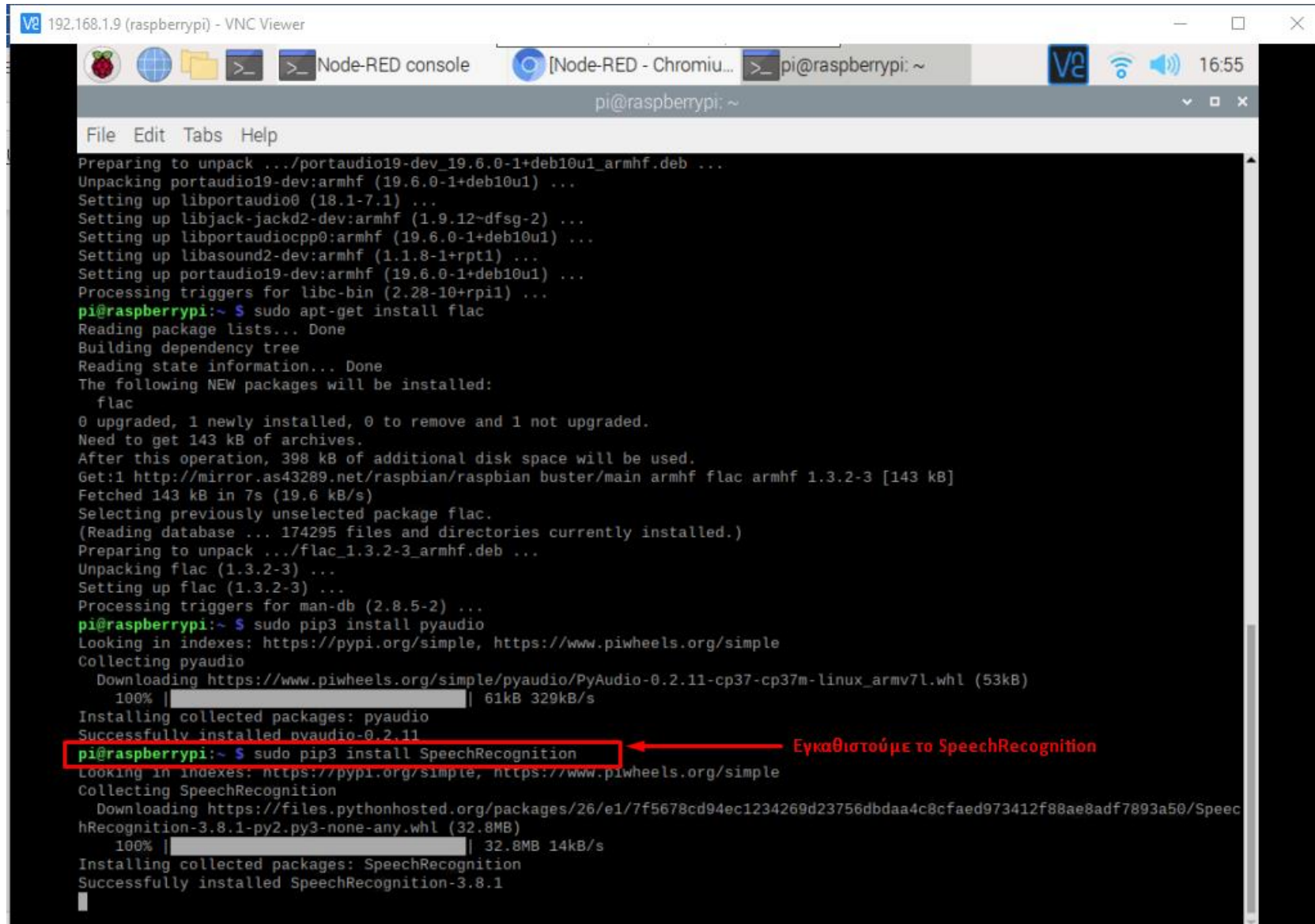
```
pi@raspberrypi:~$ sudo apt-get install mosquitto
Preparing to unpack .../mosquitto-clients_1.5.7-1+deb10u1_armhf.deb ...
Unpacking mosquitto-clients (1.5.7-1+deb10u1) ...
Setting up libmosquitto1:armhf (1.5.7-1+deb10u1) ...
Setting up libev4:armhf (1:4.25-1) ...
Setting up mosquitto-clients (1.5.7-1+deb10u1) ...
Setting up libwebsockets8:armhf (2.0.3-3) ...
Setting up mosquitto (1.5.7-1+deb10u1) ...
Created symlink /etc/systemd/system/multi-user.target.wants/mosquitto.service →
/lib/systemd/system/mosquitto.service.
Processing triggers for systemd (241-7~deb10u7+rpil) ...
Processing triggers for man-db (2.8.5-2) ...
Processing triggers for libc-bin (2.28-10+rpil) ...
pi@raspberrypi:~$ sudo systemctl enable mosquitto.service
sudo: systemctl: command not found
pi@raspberrypi:~$ sudo systemctl enable mosquitto.service
Synchronizing state of mosquitto.service with SysV service script with /lib/syst
emd/systemd-sysv-install.
Executing: /lib/systemd/systemd-sysv-install enable mosquitto
pi@raspberrypi:~$ mosquitto -v
1618836611: mosquitto version 1.5.7 starting
1618836611: Using default config.
1618836611: Opening ipv4 listen socket on port 1883.
1618836611: Error: Address already in use
pi@raspberrypi:~$
```

The terminal window is titled "pi@raspberrypi: ~" and has a menu bar with "File", "Edit", "Tabs", and "Help". The background of the terminal window shows a sunset over a landscape with a church spire.

Σταμάτημα να τρέχει ως Υπηρεσία το Mosquitto

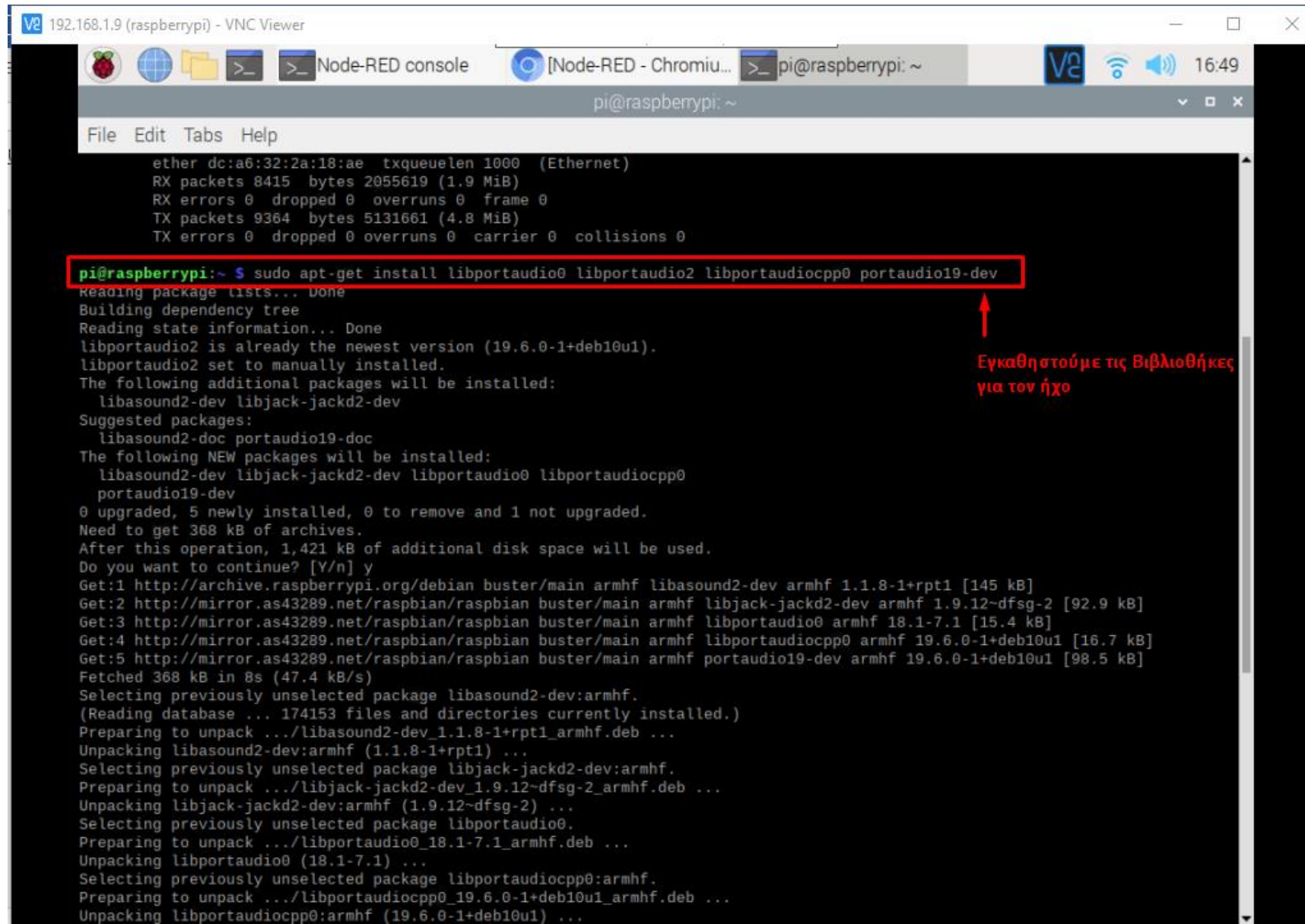


Install SpeechRecognition



```
192.168.1.9 (raspberrypi) - VNC Viewer
Node-RED console [Node-RED - Chromiu... pi@raspberrypi: ~
pi@raspberrypi: ~
File Edit Tabs Help
Preparing to unpack .../portaudio19-dev_19.6.0-1+deb10u1_armhf.deb ...
Unpacking portaudio19-dev:armhf (19.6.0-1+deb10u1) ...
Setting up libportaudio0 (18.1-7.1) ...
Setting up libjack-jackd2-dev:armhf (1.9.12~dfsg-2) ...
Setting up libportaudiocpp0:armhf (19.6.0-1+deb10u1) ...
Setting up libasound2-dev:armhf (1.1.8-1+rpt1) ...
Setting up portaudio19-dev:armhf (19.6.0-1+deb10u1) ...
Processing triggers for libc-bin (2.28-10+rpil) ...
pi@raspberrypi:~ $ sudo apt-get install flac
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  flac
0 upgraded, 1 newly installed, 0 to remove and 1 not upgraded.
Need to get 143 kB of archives.
After this operation, 398 kB of additional disk space will be used.
Get:1 http://mirror.as43289.net/raspbian/raspbian buster/main armhf flac armhf 1.3.2-3 [143 kB]
Fetched 143 kB in 7s (19.6 kB/s)
Selecting previously unselected package flac.
(Reading database ... 174295 files and directories currently installed.)
Preparing to unpack .../flac_1.3.2-3_armhf.deb ...
Unpacking flac (1.3.2-3) ...
Setting up flac (1.3.2-3) ...
Processing triggers for man-db (2.8.5-2) ...
pi@raspberrypi:~ $ sudo pip3 install pyaudio
Looking in indexes: https://pypi.org/simple, https://www.piwheels.org/simple
Collecting pyaudio
  Downloading https://www.piwheels.org/simple/pyaudio/PyAudio-0.2.11-cp37-cp37m-linux_armv7l.whl (53kB)
    100% |#####| 61kB 329kB/s
Installing collected packages: pyaudio
Successfully installed pyaudio-0.2.11
pi@raspberrypi:~ $ sudo pip3 install SpeechRecognition
Looking in indexes: https://pypi.org/simple, https://www.piwheels.org/simple
Collecting SpeechRecognition
  Downloading https://files.pythonhosted.org/packages/26/e1/7f5678cd94ec1234269d23756dbdaa4c8cfaed973412f88ae8adf7893a50/SpeechRecognition-3.8.1-py2.py3-none-any.whl (32.8MB)
    100% |#####| 32.8MB 14kB/s
Installing collected packages: SpeechRecognition
Successfully installed SpeechRecognition-3.8.1
```

Εγκατάσταση Βιβλιοθηκών για τον ήχο

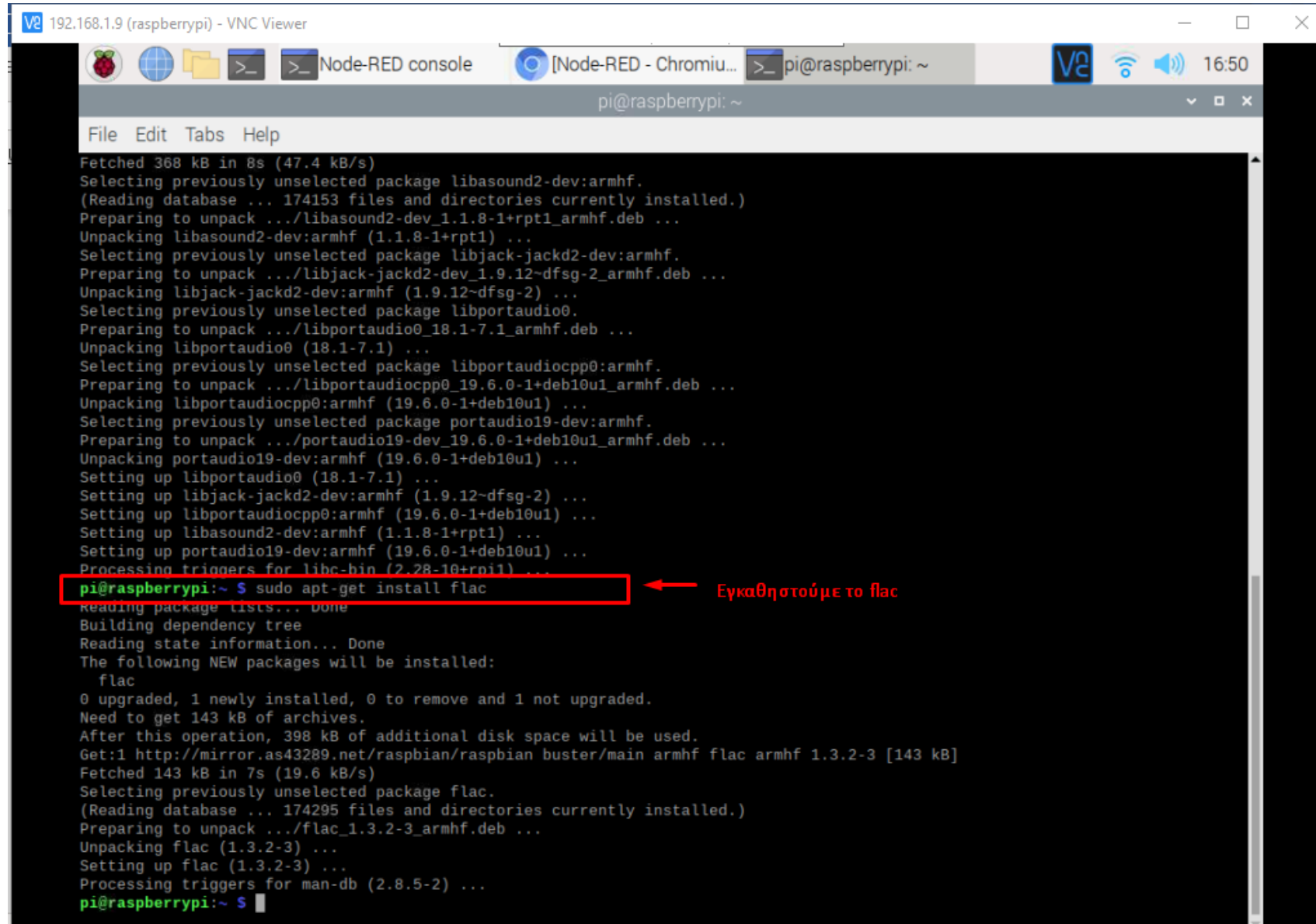


The screenshot shows a terminal window on a Raspberry Pi. The terminal output displays the command to install audio libraries and the subsequent installation process. A red box highlights the command, and a red arrow points to it with a label in Greek.

```
pi@raspberrypi:~ $ sudo apt-get install libportaudio0 libportaudio2 libportaudiocpp0 portaudio19-dev
Reading package lists... Done
Building dependency tree
Reading state information... Done
libportaudio2 is already the newest version (19.6.0-1+deb10u1).
libportaudio2 set to manually installed.
The following additional packages will be installed:
  libasound2-dev libjack-jackd2-dev
Suggested packages:
  libasound2-doc portaudio19-doc
The following NEW packages will be installed:
  libasound2-dev libjack-jackd2-dev libportaudio0 libportaudiocpp0
  portaudio19-dev
0 upgraded, 5 newly installed, 0 to remove and 1 not upgraded.
Need to get 368 kB of archives.
After this operation, 1,421 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://archive.raspberrypi.org/debian buster/main armhf libasound2-dev armhf 1.1.8-1+rpt1 [145 kB]
Get:2 http://mirror.as43289.net/raspbian/raspbian buster/main armhf libjack-jackd2-dev armhf 1.9.12~dfsg-2 [92.9 kB]
Get:3 http://mirror.as43289.net/raspbian/raspbian buster/main armhf libportaudio0 armhf 18.1-7.1 [15.4 kB]
Get:4 http://mirror.as43289.net/raspbian/raspbian buster/main armhf libportaudiocpp0 armhf 19.6.0-1+deb10u1 [16.7 kB]
Get:5 http://mirror.as43289.net/raspbian/raspbian buster/main armhf portaudio19-dev armhf 19.6.0-1+deb10u1 [98.5 kB]
Fetched 368 kB in 8s (47.4 kB/s)
Selecting previously unselected package libasound2-dev:armhf.
(Reading database ... 174153 files and directories currently installed.)
Preparing to unpack .../libasound2-dev_1.1.8-1+rpt1_armhf.deb ...
Unpacking libasound2-dev:armhf (1.1.8-1+rpt1) ...
Selecting previously unselected package libjack-jackd2-dev:armhf.
Preparing to unpack .../libjack-jackd2-dev_1.9.12~dfsg-2_armhf.deb ...
Unpacking libjack-jackd2-dev:armhf (1.9.12~dfsg-2) ...
Selecting previously unselected package libportaudio0.
Preparing to unpack .../libportaudio0_18.1-7.1_armhf.deb ...
Unpacking libportaudio0 (18.1-7.1) ...
Selecting previously unselected package libportaudiocpp0:armhf.
Preparing to unpack .../libportaudiocpp0_19.6.0-1+deb10u1_armhf.deb ...
Unpacking libportaudiocpp0:armhf (19.6.0-1+deb10u1) ...
```

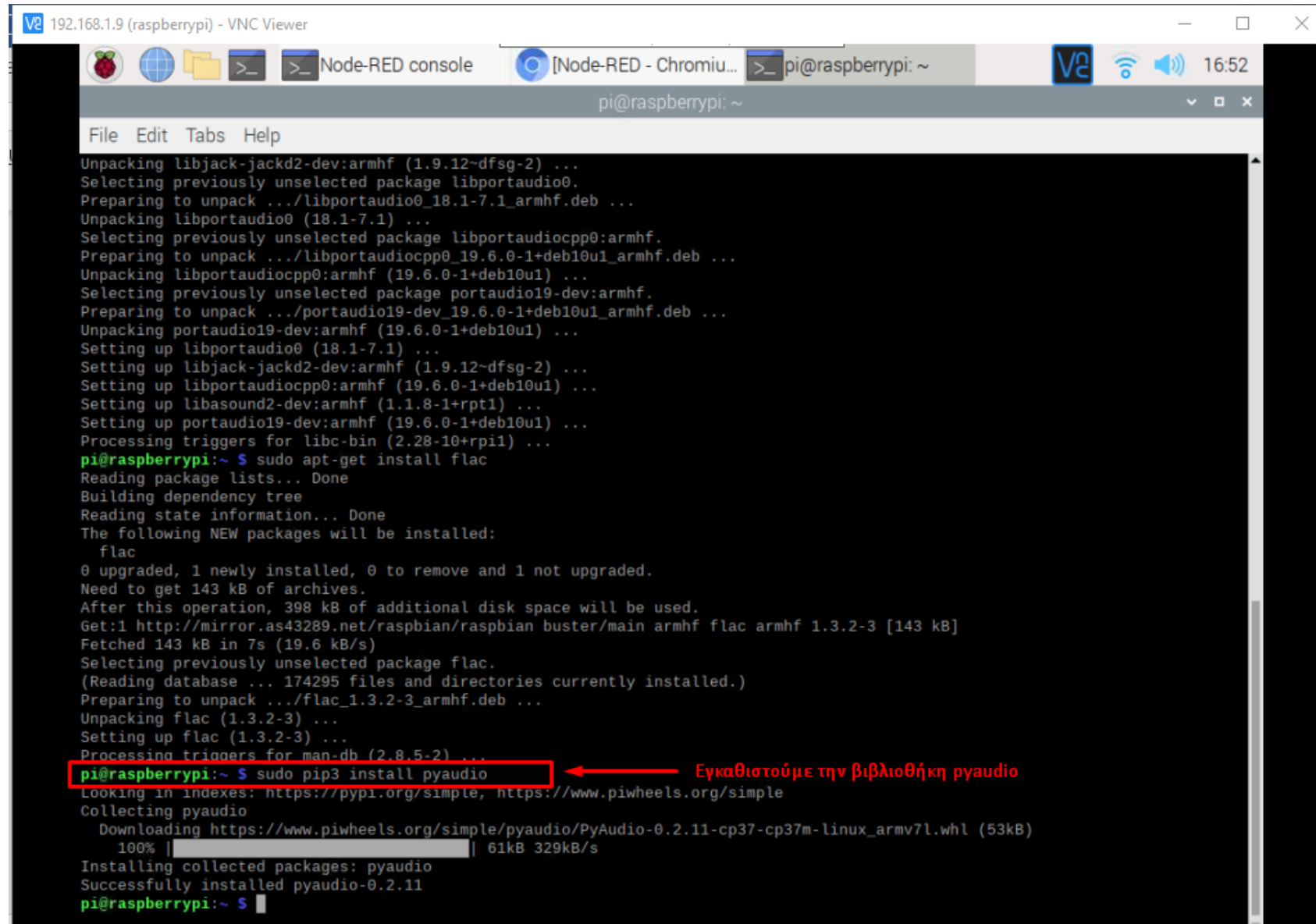
Εγκαθιστούμε τις Βιβλιοθήκες για τον ήχο

Εγκατάσταση του flac



```
192.168.1.9 (raspberrypi) - VNC Viewer
Node-RED console [Node-RED - Chromiu... pi@raspberrypi: ~
pi@raspberrypi: ~
File Edit Tabs Help
Fetched 368 kB in 8s (47.4 kB/s)
Selecting previously unselected package libasound2-dev:armhf.
(Reading database ... 174153 files and directories currently installed.)
Preparing to unpack .../libasound2-dev_1.1.8-1+rpt1_armhf.deb ...
Unpacking libasound2-dev:armhf (1.1.8-1+rpt1) ...
Selecting previously unselected package libjack-jackd2-dev:armhf.
Preparing to unpack .../libjack-jackd2-dev_1.9.12~dfsg-2_armhf.deb ...
Unpacking libjack-jackd2-dev:armhf (1.9.12~dfsg-2) ...
Selecting previously unselected package libportaudio0.
Preparing to unpack .../libportaudio0_18.1-7.1_armhf.deb ...
Unpacking libportaudio0 (18.1-7.1) ...
Selecting previously unselected package libportaudiocpp0:armhf.
Preparing to unpack .../libportaudiocpp0_19.6.0-1+deb10u1_armhf.deb ...
Unpacking libportaudiocpp0:armhf (19.6.0-1+deb10u1) ...
Selecting previously unselected package portaudio19-dev:armhf.
Preparing to unpack .../portaudio19-dev_19.6.0-1+deb10u1_armhf.deb ...
Unpacking portaudio19-dev:armhf (19.6.0-1+deb10u1) ...
Setting up libportaudio0 (18.1-7.1) ...
Setting up libjack-jackd2-dev:armhf (1.9.12~dfsg-2) ...
Setting up libportaudiocpp0:armhf (19.6.0-1+deb10u1) ...
Setting up libasound2-dev:armhf (1.1.8-1+rpt1) ...
Setting up portaudio19-dev:armhf (19.6.0-1+deb10u1) ...
Processing triggers for libc-bin (2.28-10+rpi1) ...
pi@raspberrypi:~$ sudo apt-get install flac
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  flac
0 upgraded, 1 newly installed, 0 to remove and 1 not upgraded.
Need to get 143 kB of archives.
After this operation, 398 kB of additional disk space will be used.
Get:1 http://mirror.as43289.net/raspbian/raspbian buster/main armhf flac armhf 1.3.2-3 [143 kB]
Fetched 143 kB in 7s (19.6 kB/s)
Selecting previously unselected package flac.
(Reading database ... 174295 files and directories currently installed.)
Preparing to unpack .../flac_1.3.2-3_armhf.deb ...
Unpacking flac (1.3.2-3) ...
Setting up flac (1.3.2-3) ...
Processing triggers for man-db (2.8.5-2) ...
pi@raspberrypi:~$
```


Εγκατάσταση βιβλιοθήκης pyaudio



```
192.168.1.9 (raspberrypi) - VNC Viewer
Node-RED console [Node-RED - Chromiu... pi@raspberrypi: ~
pi@raspberrypi: ~
File Edit Tabs Help
Unpacking libjack-jackd2-dev:armhf (1.9.12~dfsg-2) ...
Selecting previously unselected package libportaudio0.
Preparing to unpack .../libportaudio0_18.1-7.1_armhf.deb ...
Unpacking libportaudio0 (18.1-7.1) ...
Selecting previously unselected package libportaudiocpp0:armhf.
Preparing to unpack .../libportaudiocpp0_19.6.0-1+deb10u1_armhf.deb ...
Unpacking libportaudiocpp0:armhf (19.6.0-1+deb10u1) ...
Selecting previously unselected package portaudio19-dev:armhf.
Preparing to unpack .../portaudio19-dev_19.6.0-1+deb10u1_armhf.deb ...
Unpacking portaudio19-dev:armhf (19.6.0-1+deb10u1) ...
Setting up libportaudio0 (18.1-7.1) ...
Setting up libjack-jackd2-dev:armhf (1.9.12~dfsg-2) ...
Setting up libportaudiocpp0:armhf (19.6.0-1+deb10u1) ...
Setting up libasound2-dev:armhf (1.1.8-1+rpt1) ...
Setting up portaudio19-dev:armhf (19.6.0-1+deb10u1) ...
Processing triggers for libc-bin (2.28-10+rpi1) ...
pi@raspberrypi:~ $ sudo apt-get install flac
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following NEW packages will be installed:
  flac
0 upgraded, 1 newly installed, 0 to remove and 1 not upgraded.
Need to get 143 kB of archives.
After this operation, 398 kB of additional disk space will be used.
Get:1 http://mirror.as43289.net/raspbian/raspbian buster/main armhf flac armhf 1.3.2-3 [143 kB]
Fetched 143 kB in 7s (19.6 kB/s)
Selecting previously unselected package flac.
(Reading database ... 174295 files and directories currently installed.)
Preparing to unpack .../flac_1.3.2-3_armhf.deb ...
Unpacking flac (1.3.2-3) ...
Setting up flac (1.3.2-3) ...
Processing triggers for man-db (2.8.5-2) ...
pi@raspberrypi:~ $ sudo pip3 install pyaudio
Looking in indexes: https://pypi.org/simple, https://www.piwheels.org/simple
Collecting pyaudio
  Downloading https://www.piwheels.org/simple/pyaudio/PyAudio-0.2.11-cp37-cp37m-linux_armv7l.whl (53kB)
    100% |#####| 61kB 329kB/s
Installing collected packages: pyaudio
Successfully installed pyaudio-0.2.11
pi@raspberrypi:~ $
```

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