

AI Assistant using Raspberry Pi

Testing Document

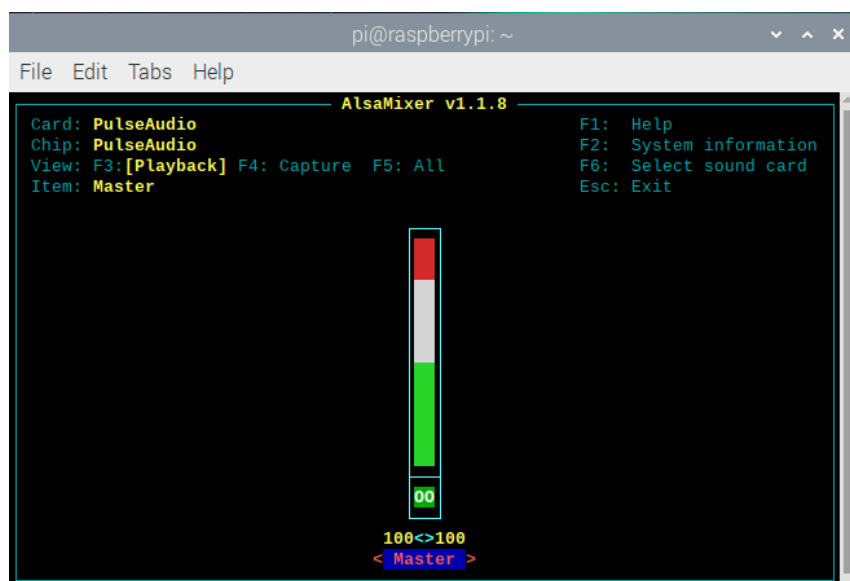
Testing of components

Microphone & microphone

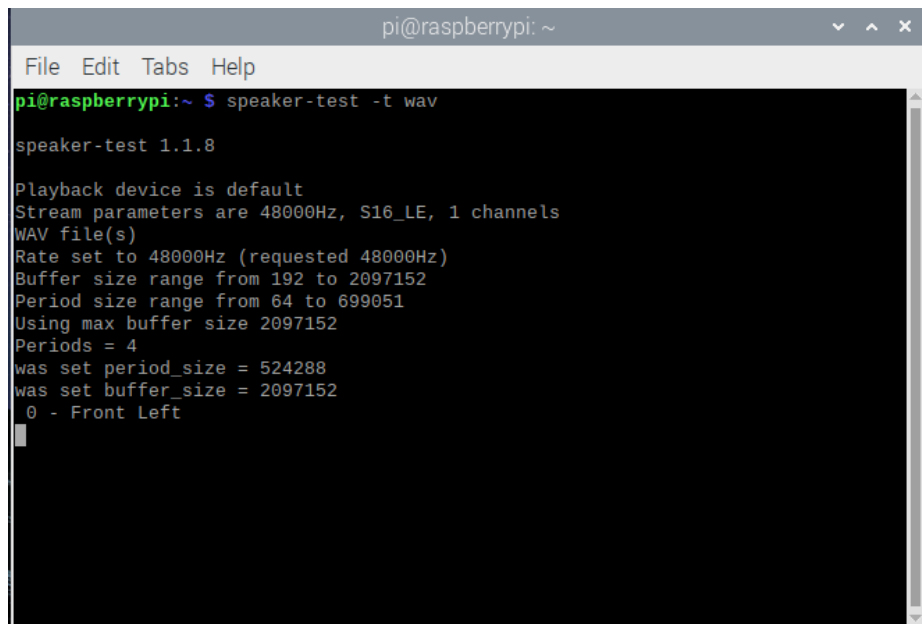
Create a new file named `.asoundrc` in the home directory (`/home/pi`). Make sure it has the right slave definitions for microphone and speaker; use the configuration below but replace `<card number>` and `<device number>` with the numbers you wrote down in the previous step. Do this for both `pcm.mic` and `pcm.speaker`.

```
pcm.!default {
    type asym
    capture.pcm "mic"
    playback.pcm "speaker"
}
pcm.mic {
    type plug
    slave {
        pcm "hw:<card number>,<device number>"
    }
}
pcm.speaker {
    type plug
    slave {
        pcm "hw:<card number>,<device number>"
    }
}
```

After this step, your speaker and mic are configured. For the testing of microphone we use alsamixer where we configure its properties.



For testing the speakers we use 'speaker-test -t wav' it sends audio messages to the speaker connected. At this step you will hear voices from your speakers and thus in this way you have properly installed the speakers as well.

A terminal window titled 'pi@raspberrypi: ~' with a menu bar (File, Edit, Tabs, Help). The command 'speaker-test -t wav' has been executed. The output shows 'speaker-test 1.1.8' followed by playback device information: 'Playback device is default', 'Stream parameters are 48000Hz, S16_LE, 1 channels', and 'WAV file(s)'. It then lists technical details: 'Rate set to 48000Hz (requested 48000Hz)', 'Buffer size range from 192 to 2097152', 'Period size range from 64 to 699051', 'Using max buffer size 2097152', 'Periods = 4', 'was set period_size = 524288', 'was set buffer_size = 2097152', and finally '0 - Front Left' with a cursor on the next line.

```
pi@raspberrypi: ~
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pi@raspberrypi:~ $ speaker-test -t wav

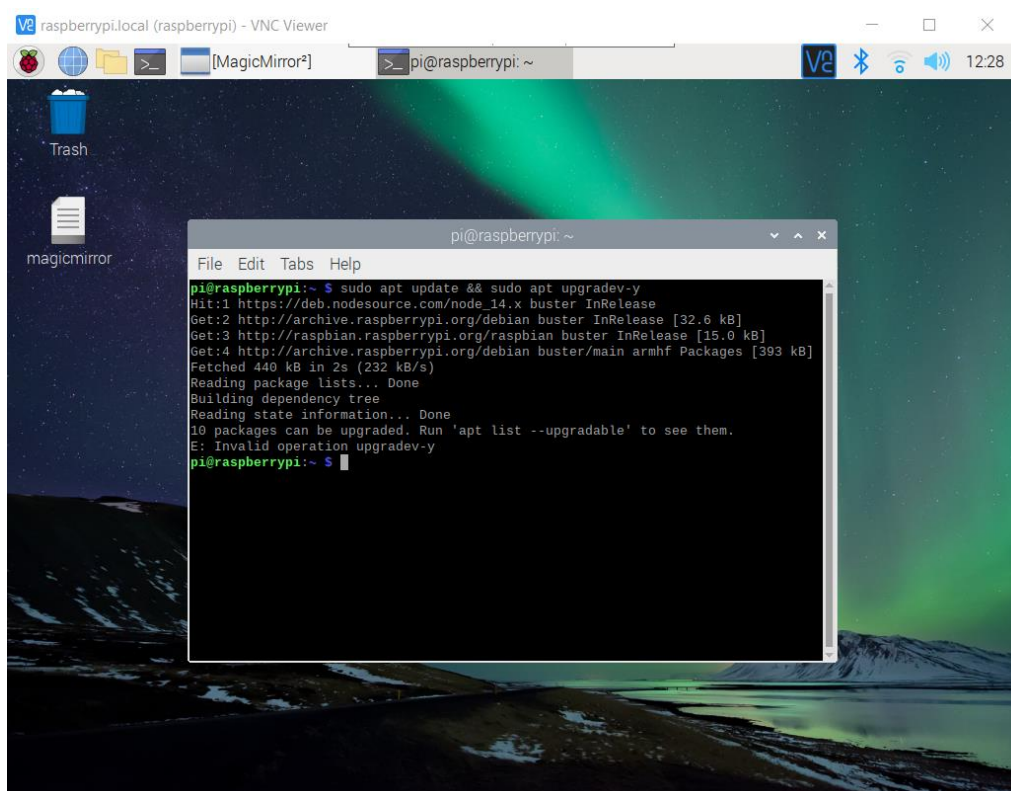
speaker-test 1.1.8

Playback device is default
Stream parameters are 48000Hz, S16_LE, 1 channels
WAV file(s)
Rate set to 48000Hz (requested 48000Hz)
Buffer size range from 192 to 2097152
Period size range from 64 to 699051
Using max buffer size 2097152
Periods = 4
was set period_size = 524288
was set buffer_size = 2097152
0 - Front Left
```

Testing of software needed

- Before downloading any software on your raspberry pi you need to update and upgrade your raspberry pi. You can do that by following the steps given in the picture below.

'sudo apt update && sudo apt upgrade -y'

A screenshot of a Raspberry Pi desktop environment viewed through a VNC viewer. The desktop has a dark background with a green aurora-like light effect. On the left, there are icons for 'Trash' and 'magicmirror'. A terminal window titled 'pi@raspberrypi: ~' is open in the center, showing the output of the command 'sudo apt update && sudo apt upgrade -y'. The output includes several 'Hit' and 'Get' lines for various repositories, followed by 'Fetching 440 kB in 2s (232 kB/s)', 'Reading package lists... Done', 'Building dependency tree', 'Reading state information... Done', and a message stating '10 packages can be upgraded. Run 'apt list --upgradable' to see them.' The command ends with an error 'E: Invalid operation upgrade -y' and a new prompt.

```
raspberrypi.local (raspberrypi) - VNC Viewer
[MagicMirror²] pi@raspberrypi: ~
pi@raspberrypi:~ $ sudo apt update && sudo apt upgrade -y
Hit:1 https://deb.nodesource.com/node_14.x buster InRelease
Get:2 http://archive.raspberrypi.org/debian buster InRelease [32.6 kB]
Get:3 http://raspbian.raspberrypi.org/raspbian buster InRelease [15.0 kB]
Get:4 http://archive.raspberrypi.org/debian buster/main armhf Packages [393 kB]
Fetching 440 kB in 2s (232 kB/s)
Reading package lists... Done
Building dependency tree
Reading state information... Done
10 packages can be upgraded. Run 'apt list --upgradable' to see them.
E: Invalid operation upgrade -y
pi@raspberrypi:~ $
```

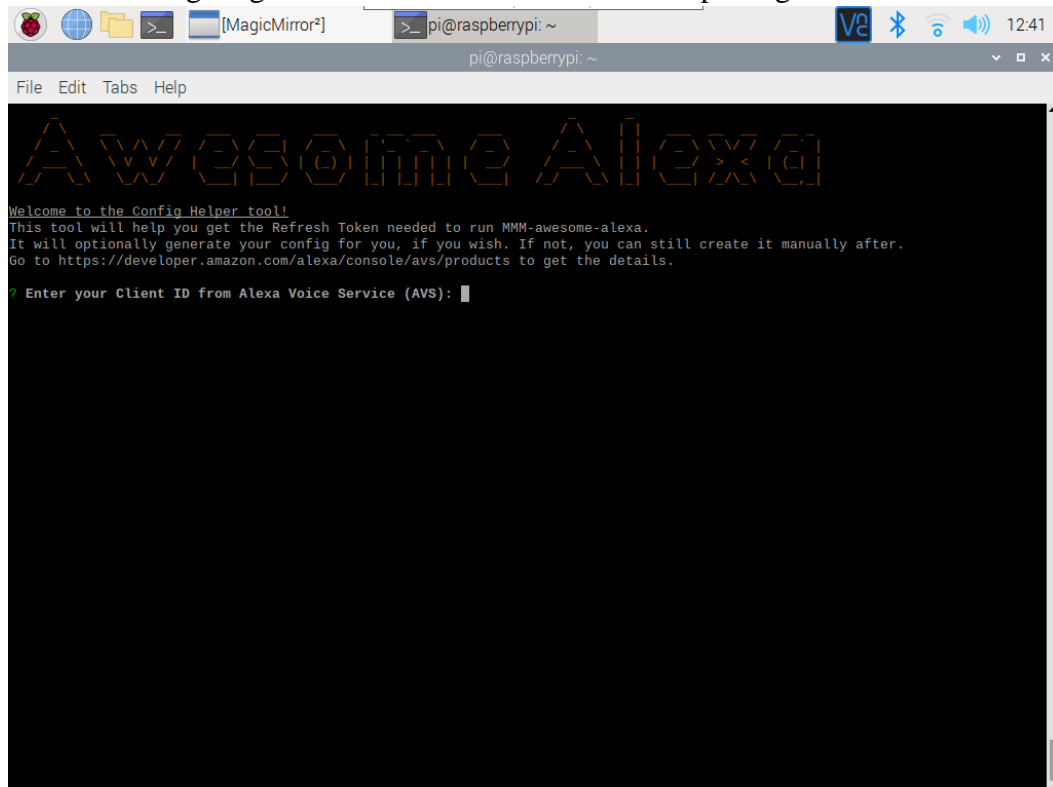
- After updating we install the magic mirror packages from the official site on your rpi.

[illegible]

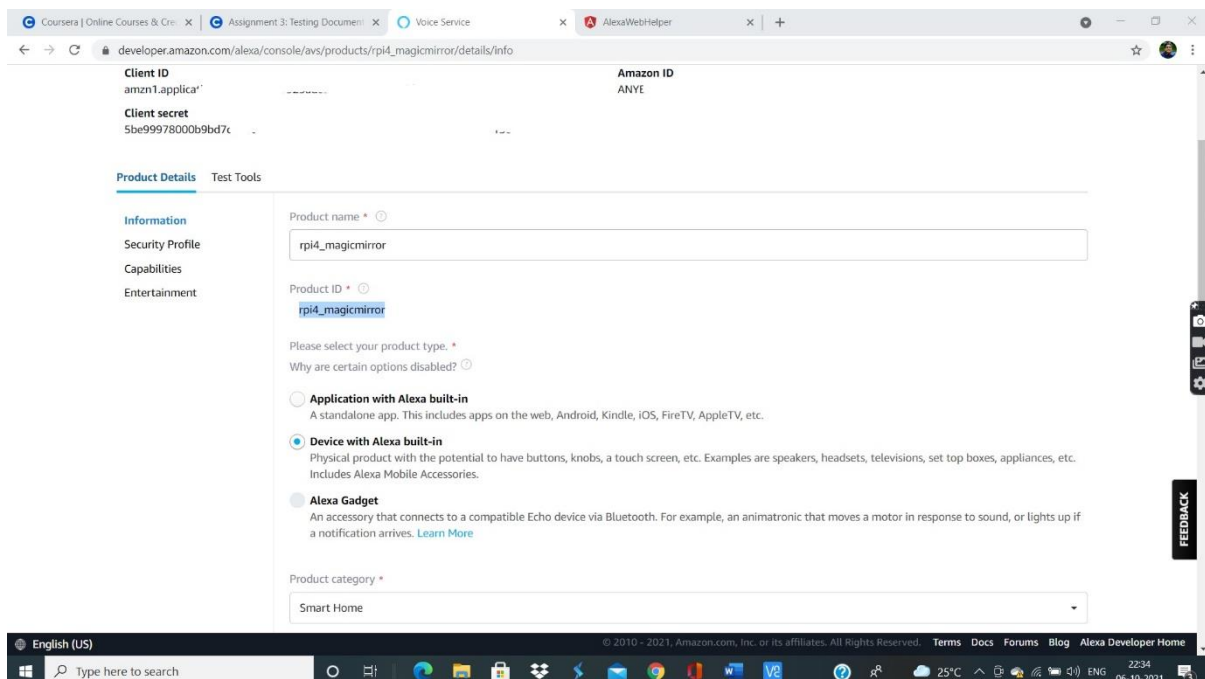
After installing magic mirror you will get this kind of display.

A screenshot of a web browser interface. At the top left, the date "Wednesday, October 6, 2021" is displayed in a light blue font, with a large digital clock showing "12:36²⁵". To the right, the text "Loading ..." appears in a light blue font. Below the date, a section titled "US HOLIDAYS" is visible, containing a list of holidays with their corresponding dates: Columbus Day (Monday at 00:00), Halloween (Oct 31st), Veterans Day (Nov 11th), Thanksgiving Day (Nov 25th), and Christmas (Dec 25th). To the right of this list, the text "WEATHER FORECAST" is displayed, followed by another "Loading ..." status. A large, white, sans-serif text overlay "Looking good today!" is centered on the page. At the bottom, a news snippet from the "New York Times" is visible, dated "5 hours ago", with the headline "An Ethically Challenged Presidency".

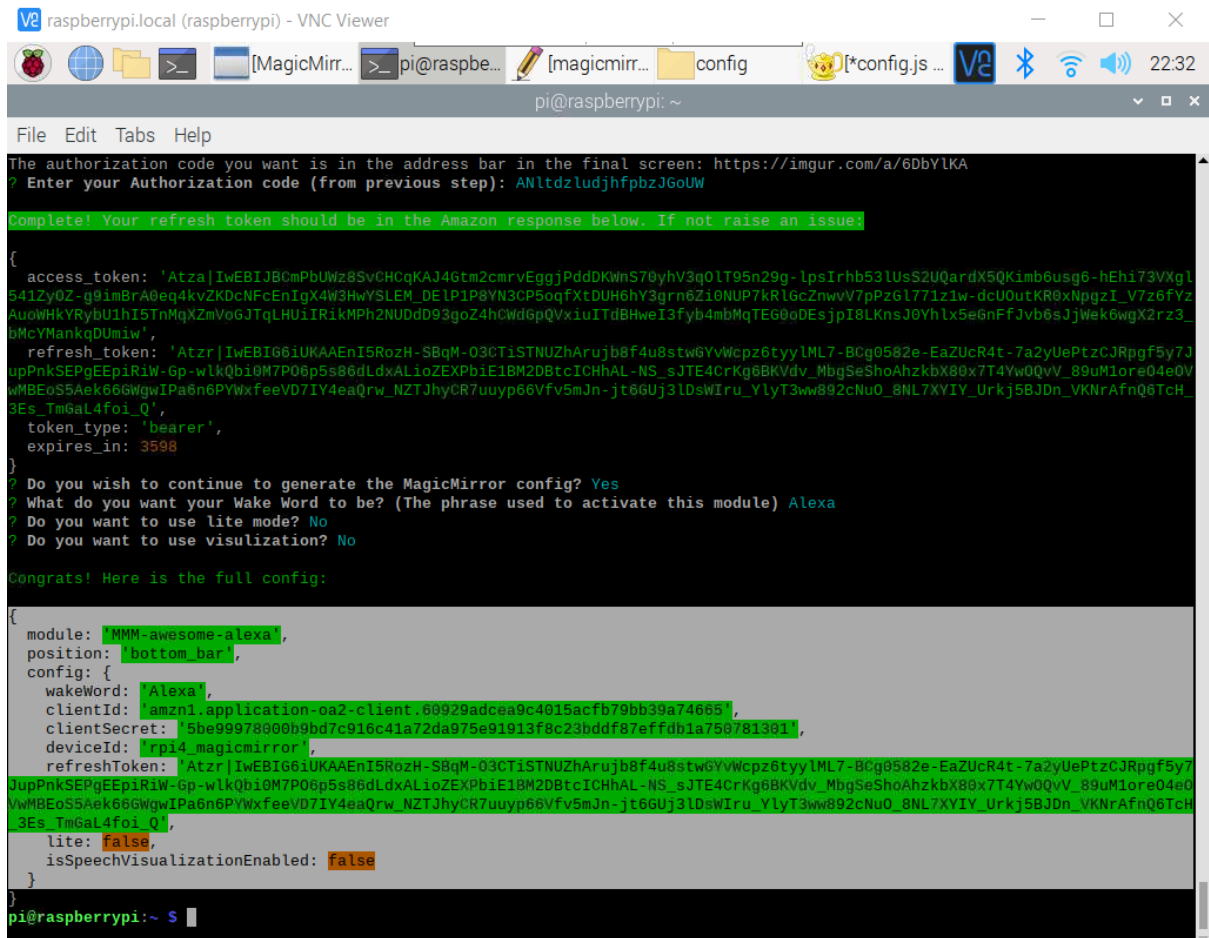
- After installing magic mirror we install amazon alexa package.



- Here we need to input our client and service id from the amazon developer site where we have created our project. Here I have created an amazon developer account to use alexa for my raspberry pi. I have hidden my client id and client service id.



- After the previous step I would get config for my json file.



```
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The authorization code you want is in the address bar in the final screen: https://imgur.com/a/6DbYLKA
? Enter your Authorization code (from previous step): ANltdzLudjhfpbzJ6oUW

Complete! Your refresh token should be in the Amazon response below. If not raise an issue:

{
  access_token: 'Atza|IwEBIJBcmPbUwz8SvCHCqKAJ4Gtm2cmrvEggjPddDKWnS70yhV3q0LT95n29g-lpsIrhb53lUsS2UQardX5QKimb6usg6-hEhi73VXgl
541Zy0Z-g9imBrA0eq4kvZKdCNfEnIgX4W3HwYSLEM_DELP1P8YN3CP5oqfXtDUH6hY3grn6Zi0NUP7KRlgcZnwwV7pPzG1771z1w-dcUOutKR0xNpgzI_V7z6fYz
AuoWHkYRYbU1h15TmMqXzmVoGJTqLHU1IRikMPH2NUddD93goZ4hCwd6pQVxiuITdBHWeI3fyb4mbMqTEG0oDEsjI8LKnsJ0YhLx5e6nFFjvb6sJjWek6wgX2rz3_
bMcYMankqDUmiv',
  refresh_token: 'Atzr|IwEBIG6iUKAAEnI5RozH-SBqM-03CTiSTNUZhArujb8f4u8stw6YvWcpz6tyy1ML7-BCg0582e-EaZUcR4t-7a2yUePtzCJRpgf5y7J
upPnkSEPgEEpiRiW-Gp-wlkQbi0M7P06p5s86dLdxALioZEXpbiE18M2DBtcICHhAL-NS_sJTE4CrKq6BKvdv_MbgSeShoAhzkbX80x7T4Yw0QvV_89uM1ore04e0V
wMBEoS5Aek66GwGwIPA6n6PYWxfeeVD7IY4eaQrw_NZTJhyCR7uuypp6VfvmJn-jt6GUj3lDswIru_YlyT3ww892cNu0_8NL7XYIY_Urkj5BJDn_VKNrAfnQ6Tch_
3Es_TmGaL4foi_Q_',
  token_type: 'bearer',
  expires_in: 3598
}

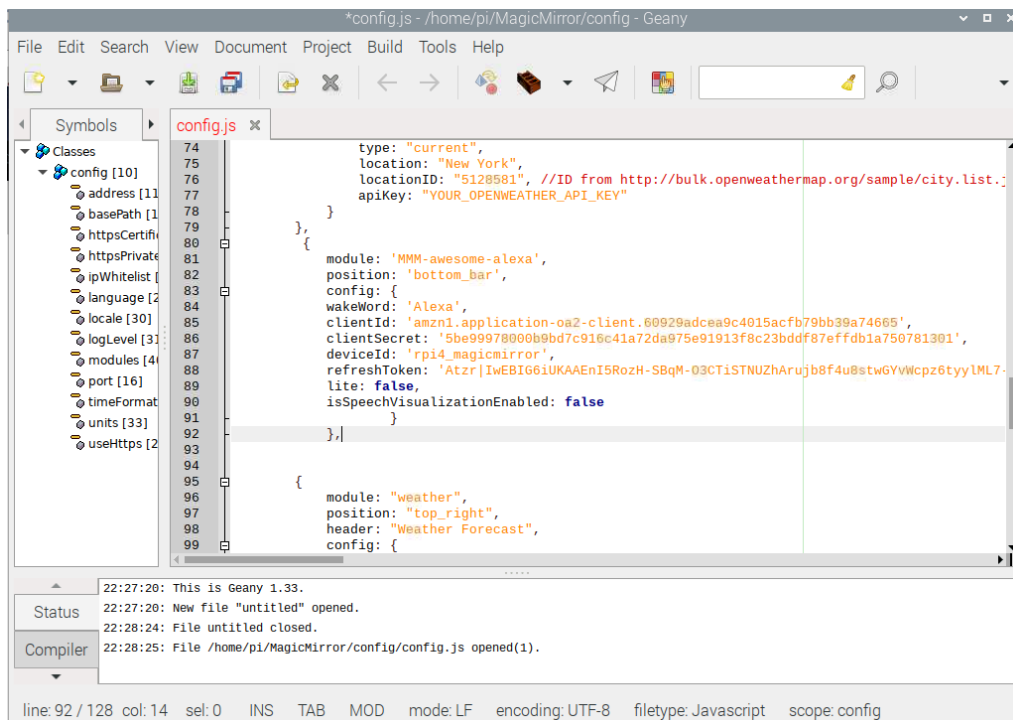
? Do you wish to continue to generate the MagicMirror config? Yes
? What do you want your Wake Word to be? (The phrase used to activate this module) Alexa
? Do you want to use lite mode? No
? Do you want to use visualization? No

Congrats! Here is the full config:

{
  module: 'MMM-awesome-alexa',
  position: 'bottom_bar',
  config: {
    wakeWord: 'Alexa',
    clientId: 'amzn1.application-oa2-client.60929adcea9c4015acfb79bb39a74665',
    clientSecret: '5be99978000b9bd7c916c41a72da975e91913f8c23bddf87effdb1a750781301',
    deviceId: 'rpi4_magicmirror',
    refreshToken: 'Atzr|IwEBIG6iUKAAEnI5RozH-SBqM-03CTiSTNUZhArujb8f4u8stw6YvWcpz6tyy1ML7-BCg0582e-EaZUcR4t-7a2yUePtzCJRpgf5y7J
upPnkSEPgEEpiRiW-Gp-wlkQbi0M7P06p5s86dLdxALioZEXpbiE18M2DBtcICHhAL-NS_sJTE4CrKq6BKvdv_MbgSeShoAhzkbX80x7T4Yw0QvV_89uM1ore04e0V
wMBEoS5Aek66GwGwIPA6n6PYWxfeeVD7IY4eaQrw_NZTJhyCR7uuypp6VfvmJn-jt6GUj3lDswIru_YlyT3ww892cNu0_8NL7XYIY_Urkj5BJDn_VKNrAfnQ6Tch_
3Es_TmGaL4foi_Q_',
    lite: false,
    isSpeechVisualizationEnabled: false
  }
}

pi@raspberrypi:~$
```

- Now I would have to make the changes in the json file of magic mirror.



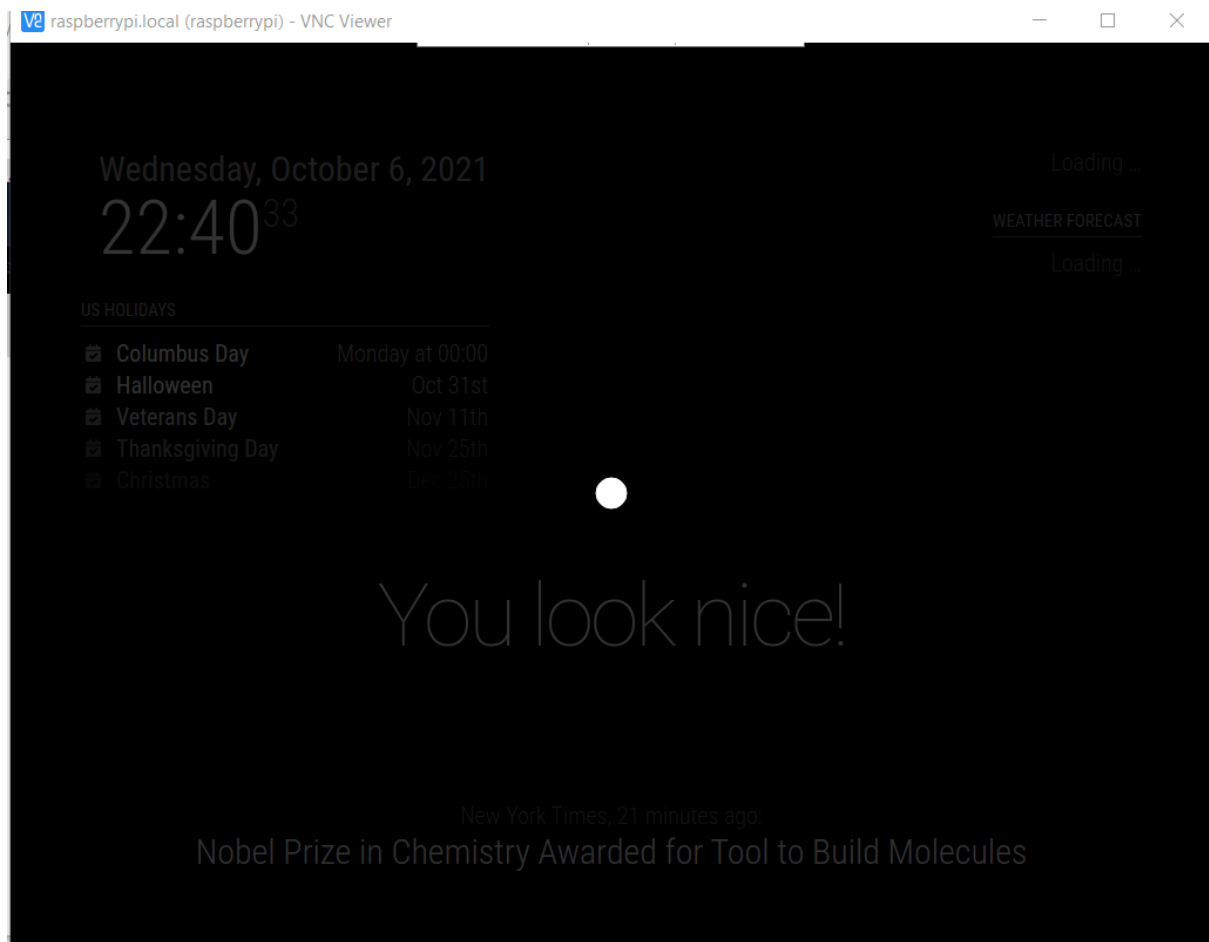
```
*config.js - /home/pi/MagicMirror/config - Geany

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74 type: "current",
75 location: "New York",
76 locationID: "5128581", //ID from http://bulk.openweathermap.org/sample/city.list.
77 apiKey: "YOUR_OPENWEATHER_API_KEY"
78 },
79 {
80 module: 'MMM-awesome-alexa',
81 position: 'bottom_bar',
82 config: {
83 wakeWord: 'Alexa',
84 clientId: 'amzn1.application-oa2-client.60929adcea9c4015acfb79bb39a74665',
85 clientSecret: '5be99978000b9bd7c916c41a72da975e91913f8c23bddf87effdb1a750781301',
86 deviceId: 'rpi4_magicmirror',
87 refreshToken: 'Atzr|IwEBIG6iUKAAEnI5RozH-SBqM-03CTiSTNUZhArujb8f4u8stw6YvWcpz6tyy1ML7-
88 BCg0582e-EaZUcR4t-7a2yUePtzCJRpgf5y7JupPnkSEPgEEpiRiW-Gp-wlkQbi0M7P06p5s86dLdxALioZEXpbiE18M2DBtcICHhAL-NS_sJTE4CrKq6BKvdv_MbgSeShoAhzkbX80x7T4Yw0QvV_89uM1ore04e0V
89 wMBEoS5Aek66GwGwIPA6n6PYWxfeeVD7IY4eaQrw_NZTJhyCR7uuypp6VfvmJn-jt6GUj3lDswIru_YlyT3ww892cNu0_8NL7XYIY_Urkj5BJDn_VKNrAfnQ6Tch_
90 3Es_TmGaL4foi_Q_',
91 lite: false,
92 isSpeechVisualizationEnabled: false
93 },
94 },
95 {
96 module: "weather",
97 position: "top_right",
98 header: "Weather Forecast",
99 config: {
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line: 92 / 128 col: 14 sel: 0 INS TAB MOD mode: LF encoding: UTF-8 filetype: Javascript scope: config
```

- Now if no errors are seen then the magic mirror will open with built in alexa. When you speak the keyword 'alexa' it records your voice and sends response.



Here is a clear example of alexa recording my commands.

Testing Amazon Alexa on my Raspberry Pi

Amazon alexa can be tested with various of commands. 'Hows the weather in New York', 'How are you', 'Play some music', 'introduce yourself'. Etc

I'll state few examples:

- Speech to Text Conversion
 - (AVS) is a Speech-To-Text (STT) engine which is used to convert the commands given by the user in audio input to text form, so that these commands can be interpreted by the modules properly. To use (AVS) engine, an application has to be created in the Amazon developers console and the generated API key has to be used to access the speech engine. It requires continuous internet connection as data is sent over the Amazon servers.
- Query Processor
 - The Voice Command System has a module for query processing which works in general like many query processors do. That means, taking the input from the users, searching for relevant outputs and then presenting the user with the appropriate output. In this system we are using the site wolfram alpha as the source for implementing query processing in the system. The queries that can

be passed to this module include retrieving information about famous personalities, simple mathematical calculations, description of any general object etc.

- Weather
 - This module tells the user about the weather conditions of the location whose station identifier is specified in the profile of the user. This module can be executed by using the keyword “weather”. The weather information is taken from the weather underground service which includes the details of temperature, wind speed and direction etc. It generates an error message, if the information cannot be retrieved for the specified location
- Jokes
 - Joke module can be used for entertainment purposes by the user. This module works on the keywords “joke” .The jokes used in this module are predefined in a text file from which the jokes are read in a random order. A start and end line is present in every joke to differentiate it from others present in the file. All the lines of a joke are spoken by the system in the specified order only

Thus in this way we have come to a conclusion that all our functions are working properly.

Alexa and Magic Mirror applications has been properly being installed and tested.

The speakers and microphone has been Verified and tested properly.

And by performing the examples mentioned above we can say that all the components have been integrated together and is working properly.