Video Streaming with Raspberry Pi Camera

Link: https://randomnerdtutorials.com/video-streaming-with-raspberry-pi-camera/

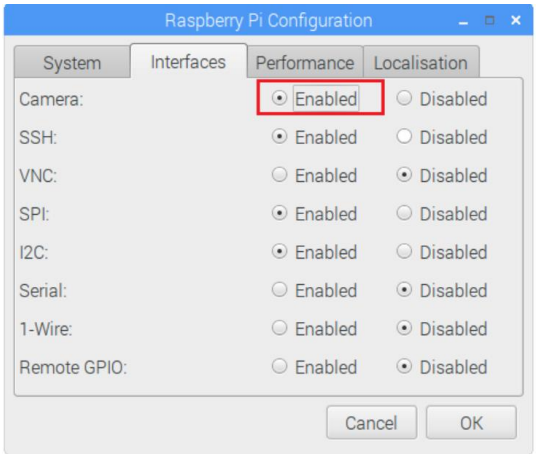
In this post we're going to show you how you can do video streaming with a Raspberry Pi and a Raspberry Pi Camera – how to stream live video into a web page that you can access in any device that has a browser and is connected to the same network the Pi is. This is useful to apply to a home surveillance camera, for example.

Prerequisites:

- You should already be familiar with the Raspberry Pi board – read Getting Started with Raspberry Pi
- You should have the Raspbian or Raspbian Lite operating system installed in your Raspberry Pi
- You can read this post for an introduction to the Raspberry Pi Camera V2 module

Enable the Rasperry Pi Camera Module

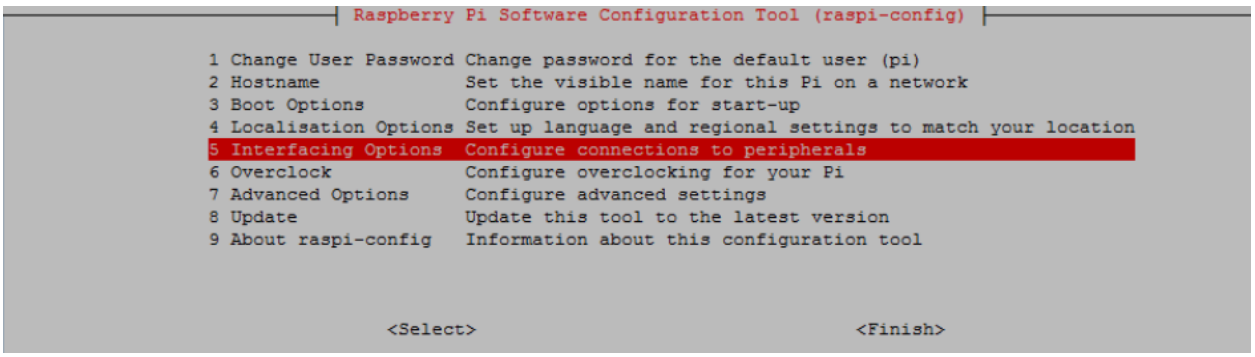
If you're using the Raspberry Pi Camera Module, you need to enable the camera software in your Raspberry Pi in order to use it. In the Desktop environment, go to the **Raspberry Pi Configuration** window under the **Preferences** menu, open the **Interfaces** tab and enable the **Camera** as shown in figure below.



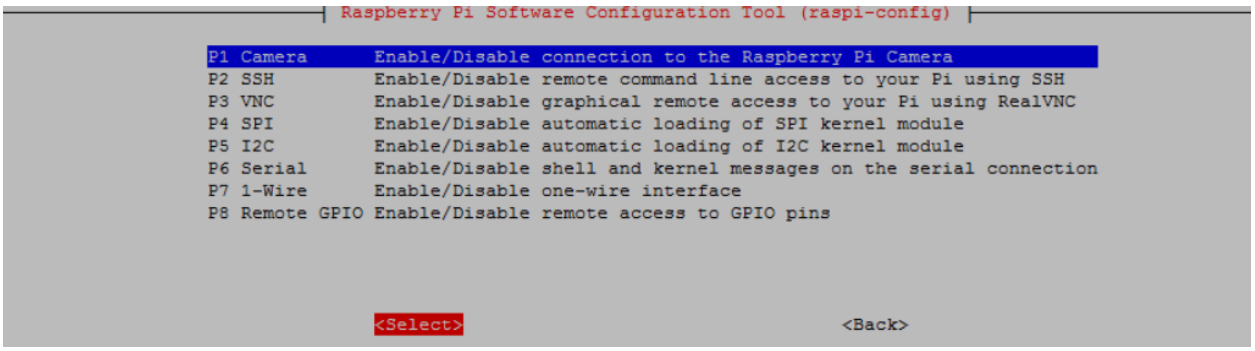
Or, in the **Terminal** window, type the following command:

```
pi@raspberry:~ $ sudo raspi-config
```

You should see the Raspberry Pi software configuration tool. Select the **Interfacing Options**:



Enable the camera and reboot your Pi:



Find the Raspberry Pi IP address

To access your video streaming web server, you need to know your Raspberry Pi IP address. For that, use the following command:

```
pi@raspberry:~ $ ifconfig
```

You'll be given a bunch of information, including your Raspberry Pi IP address. In my case, the RPi IP address is **192.168.1.112**.

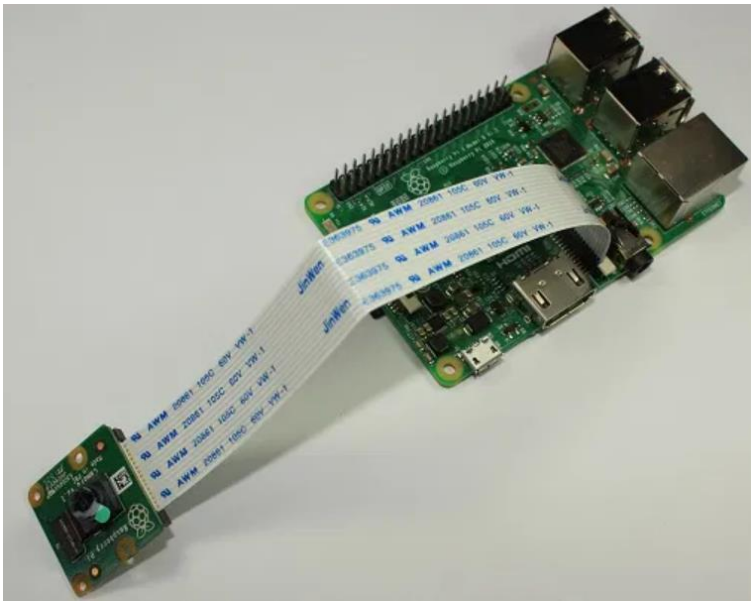
```
pi@raspberrypi:~ $ ifconfig
eth0      Link encap:Ethernet  HWaddr b8:27:eb:6e:75
          inet6 addr: fe80::226:5629:125d         Scope:Link
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:200 errors:0 dropped:0 overruns:0 frame:0
          TX packets:200 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1
          RX bytes:16656 (16.2 KiB)  TX bytes:16656 (16.2 KiB)

wlan0     Link encap:Ethernet  HWaddr b8:27:eb:3b:20:17
          inet addr:192.168.1.112  Bcast:192.168.1.255  Mask:255.255.255.0
          inet6 addr: 2001:8a0:e3cb:9501:67d9:796b:3ba          Scope:Global
          inet6 addr: fe80::23f8:a8ee:336          Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:496 errors:0 dropped:0 overruns:0 frame:0
          TX packets:454 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:38462 (37.5 KiB)  TX bytes:231924 (226.4 KiB)
```

Connect the camera

Connecting the Raspberry Pi Camera Module is easy. With the Pi shutdown, connect the camera to the Pi CSI port as shown in the following figure. Make sure the camera is connected in the right orientation with the ribbon blue letters facing up as shown in the next figure.



Writing the script

The script for video streaming is shown below. You can find this script at the official PiCamera package documentation.
Create a new file called **rpi_camera_surveillance_system.py**:

```
pi@raspberrypi:~ $ nano rpi_camera_surveillance_system.py
```

Copy the following code to your newly created file:

```
# Web streaming example
# Source code from the official PiCamera package
# http://picamera.readthedocs.io/en/latest/recipes2.html#web-streaming

import io
import picamera
import logging
import socketserver
from threading import Condition
from http import server

PAGE="""\
<html>
<head>
<title>Raspberry Pi - Surveillance Camera</title>
</head>
<body>
<center><h1>Raspberry Pi - Surveillance Camera</h1></center>
<center><img src="stream.mjpg" width="640" height="480"></center>
</body>
</html>
"""

class StreamingOutput(object):
    def __init__(self):
        self.frame = None
        self.buffer = io.BytesIO()
        self.condition = Condition()

    def write(self, buf):
        if buf.startswith(b'\xff\xd8'):
            # New frame, copy the existing buffer's content and notify all
            # clients it's available
            self.buffer.truncate()
            with self.condition:
                self.frame = self.buffer.getvalue()
                self.condition.notify_all()
            self.buffer.seek(0)
        return self.buffer.write(buf)

class StreamingHandler(server.BaseHTTPRequestHandler):
    def do_GET(self):
        if self.path == '/':
            self.send_response(301)
            self.send_header('Location', '/index.html')
            self.end_headers()
        elif self.path == '/index.html':
            content = PAGE.encode('utf-8')
            self.send_response(200)
            self.send_header('Content-Type', 'text/html')
            self.send_header('Content-Length', len(content))
            self.end_headers()
            self.wfile.write(content)
        elif self.path == '/stream.mjpg':
            self.send_response(200)
            self.send_header('Age', 0)
            self.send_header('Cache-Control', 'no-cache, private')
            self.send_header('Pragma', 'no-cache')
            self.send_header('Content-Type', 'multipart/x-mixed-replace; boundary=FRAME')
```

```
            self.end_headers()
            try:
                while True:
                    with output.condition:
                        output.condition.wait()
                        frame = output.frame
                    self.wfile.write(b'--FRAME\r\n')
                    self.send_header('Content-Type', 'image/jpeg')
                    self.send_header('Content-Length', len(frame))
                    self.end_headers()
                    self.wfile.write(frame)
                    self.wfile.write(b'\r\n')
            except Exception as e:
                logging.warning(
                    'Removed streaming client %s: %s',
                    self.client_address, str(e))
        else:
            self.send_error(404)
            self.end_headers()

class StreamingServer(socketserver.ThreadingMixIn, server.HTTPServer):
    allow_reuse_address = True
    daemon_threads = True

with picamera.PiCamera(resolution='640x480', framerate=24) as camera:
    output = StreamingOutput()
    #Uncomment the next line to change your Pi's Camera rotation (in degrees)
    #camera.rotation = 90
    camera.start_recording(output, format='mjpeg')
    try:
        address = ('', 8000)
        server = StreamingServer(address, StreamingHandler)
        server.serve_forever()
    finally:
        camera.stop_recording()
```

To save your file press Ctrl+X, type Y and Enter.

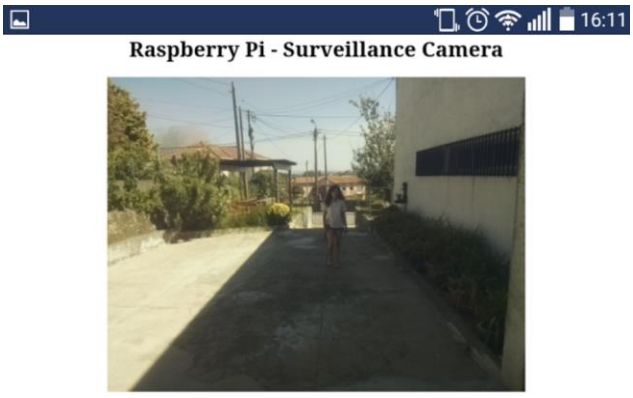
Accessing the video streaming

After writing the scrip, you can run it using Python 3. Run the next command:

```
pi@raspberrypi:~ $ python3 rpi_camera_surveillance_system.py
```

Once the script is running, you can access your video streaming web server at: http://**<Your_Pi_IP_Address>**:8000. Replace with your own Raspberry Pi IP address, in my case **http://192.168.1.112:8000**.
You can access the video streaming through any device that has a browser and is connected to the same network that your Pi.

You can use your Pi to monitor your home as a surveillance camera:



Wrapping up

I hope this project was useful! You could easily upgrade this home surveillance device to record video or notify you when motion is detected.

We also have a project on how to build a complete CCTV system with the Raspberry Pi using MotionEyeOS. Feel free to take a look.