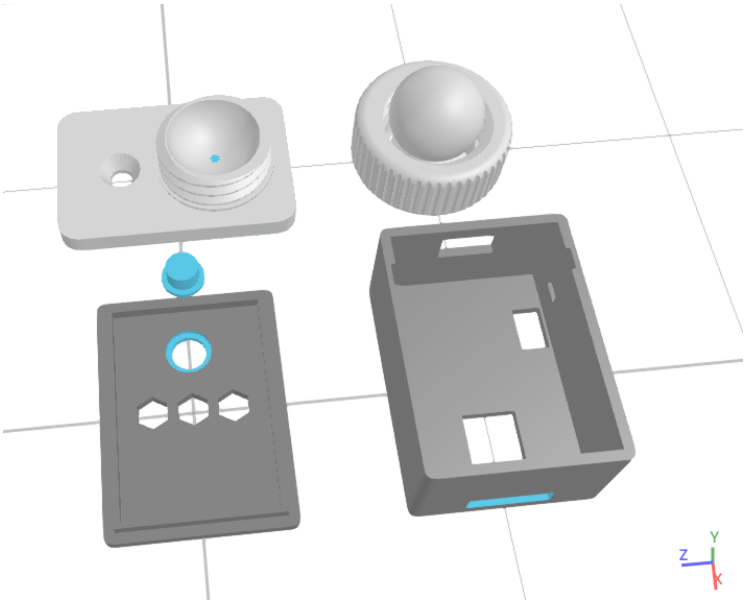
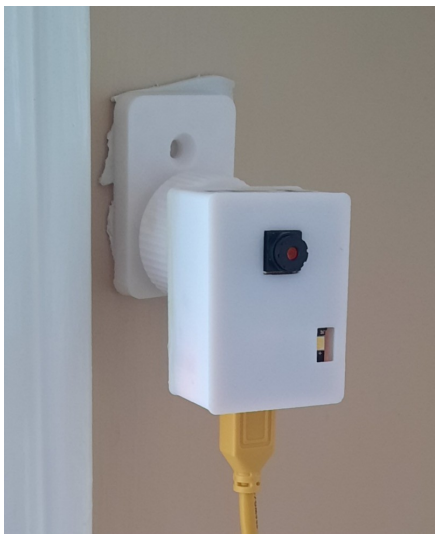
Simple Surveillance Camera

This probably sounds dumb but I wanted to make sure my birds were not starving to death anytime I needed to travel. The solution was 2 very inexpensive (less than $10) ESP32 CAM modules. These are pretty much plug and play regarding hardware. I just needed to print a case and write some code (code at bottom of this page), and the images are sent to my server in 5 minute intevals. For night time there is a flash built into the ESP32 CAM which actually works well, even in larger areas.

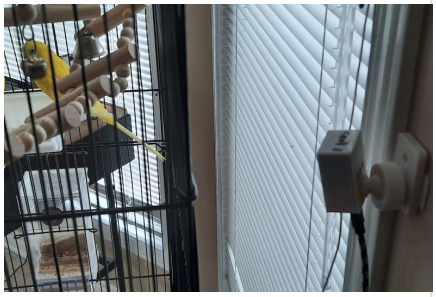
Here is the 3d printer file for the case: esp32_case.zip



The printed case assembled:







And here is what I see on my webpage:



So there you have it - the ultimate cheap-ass bird cam!

In case you want to do this yourself here's the code I used:

```
#include <WiFi.h>
#include <EEPROM.h>
#include <esp_sleep.h>
#define CAMERA_MODEL_AI_THINKER
#include "camera_pins.h"
#include "esp_camera.h"

int activeConnection = 1;


const String ssid1 = "xxxx";
const String password1 = "xxxx";
```

```
// silo
const String ssid2 = "xxxxx";
const String password2 = "xxxxxx";

String source = "camera1";

String serverName = "xx.xxx.ca";
String serverPath = "/xxxx/setphoto.php?source=" + source;

const int serverSendInterval = 5; // 5 minutes between sending a photo update to the server

const int serverPort = 80;

#define LED_BUILTIN 4
#define EEPROM_SIZE 4
int eepromPingsAddress = 0;
float totalServerPings = 0;
int eepromFailedPingsAddress = 1;
float totalServerPingFails = 0;
int eepromActiveConnection = 1;
long secondsOfHour = 0;
bool wifiConnected = false;
bool wifiPaused = false;
int wifiPausedTick = 0;
bool wifiSleeping = false;
bool serverFailed = false;
int wifiConnectionAttempts = 0;

WiFiClient client;

void setupLedFlash(int pin);

void setup() {

  Serial.begin(115200);
  Serial.setDebugOutput(true);
  Serial.println();

  camera_config_t config;
  config.ledc_channel = LEDC_CHANNEL_0;
```

```
config.ledc_timer = LEDC_TIMER_0;
config.pin_d0 = Y2_GPIO_NUM;
config.pin_d1 = Y3_GPIO_NUM;
config.pin_d2 = Y4_GPIO_NUM;
config.pin_d3 = Y5_GPIO_NUM;
config.pin_d4 = Y6_GPIO_NUM;
config.pin_d5 = Y7_GPIO_NUM;
config.pin_d6 = Y8_GPIO_NUM;
config.pin_d7 = Y9_GPIO_NUM;
config.pin_xclk = XCLK_GPIO_NUM;
config.pin_pclk = PCLK_GPIO_NUM;
config.pin_vsync = VSYNC_GPIO_NUM;
config.pin_href = HREF_GPIO_NUM;
config.pin_sccb_sda = SIOD_GPIO_NUM;
config.pin_sccb_scl = SIOC_GPIO_NUM;
config.pin_pwdn = PWDN_GPIO_NUM;
config.pin_reset = RESET_GPIO_NUM;
config.xclk_freq_hz = 20000000;
config.frame_size = FRAMESIZE_UXGA;
config.pixel_format = PIXFORMAT_JPEG; // for streaming
config.grab_mode = CAMERA_GRAB_LATEST;
config.fb_location = CAMERA_FB_IN_PSRAM;
config.jpeg_quality = 12;
config.fb_count = 3;

pinMode(LED_BUILTIN, OUTPUT);

// camera init
esp_err_t err = esp_camera_init( & config);
if (err != ESP_OK) {
  Serial.printf("Camera init failed with error 0x%x", err);
  delay(1000);
  ESP.restart();
}

//Init EEPROM
EEPROM.begin(EEPROM_SIZE);

activeConnection = EEPROM.read(eepromActiveConnection);
```

```
Serial.print("eepromActiveConnection :");
Serial.println(activeConnection);

if (isnan(activeConnection)) {
  activeConnection = 1;
}

if (activeConnection == 0) {
  activeConnection = 1;
}

if (activeConnection > 2) {
  activeConnection = 2;
}
Serial.print("activeConnection: ");
Serial.println(activeConnection);

float pingData = EEPROM.readFloat(eepromPingsAddress);
if (isnan(pingData)) {
  pingData = 0;
}
totalServerPings = pingData;
EEPROM.end();
EEPROM.begin(EEPROM_SIZE);
float pingFailData = EEPROM.readFloat(eepromFailedPingsAddress);
if (isnan(pingFailData)) {
  pingFailData = 0;
}
totalServerPingFails = pingFailData;
EEPROM.end();

if (!connectToWiFi()) {
  delay(2000);
  WiFi.disconnect();
  delay(1000);
  if (activeConnection == 1) {
    activeConnection = 2;
  } else {
    activeConnection = 1;
  }
```

```
    connectToWiFi();
  }

}

void loop() {

  delay(serverSendInterval * 60 * 1000);

  secondsOfHour += serverSendInterval * 60;

  // after 24 hours reset this integer
  if (secondsOfHour > 86400) {
    secondsOfHour = 1;
    ESP.restart();
  }

  sendPhoto();

}

void sendPhoto() {

  String getAll;
  String getBody;

  camera_fb_t * fb = NULL;
  digitalWrite(LED_BUILTIN, HIGH);
  delay(500); // allow time for led to fully illuminate
  fb = esp_camera_fb_get();
  delay(50);
  digitalWrite(LED_BUILTIN, LOW);

  if (!fb) {
    Serial.println("Camera capture failed");
    delay(1000);
    ESP.restart();
  }

  setWifiSleepMode(false);
```

```
  delay(5000);

  Serial.println("Connecting to server: " + serverName);

  if (client.connect(serverName.c_str(), serverPort)) {
    Serial.println("Connection successful!");
    String head = "--ImpresstoDocs\r\nContent-Disposition: form-data; name=\"imageFile\";
filename=\"esp32-cam.jpg\"\r\nContent-Type: image/jpeg\r\n\r\n";
    String tail = "\r\n--ImpresstoDocs--\r\n";

    uint32_t imageLen = fb -> len;
    uint32_t extraLen = head.length() + tail.length();
    uint32_t totalLen = imageLen + extraLen;

    client.println("POST " + serverPath + " HTTP/1.1");
    client.println("Host: " + serverName);
    client.println("Content-Length: " + String(totalLen));
    client.println("Content-Type: multipart/form-data; boundary=ImpresstoDocs");
    client.println();
    client.print(head);

    uint8_t * fbBuf = fb -> buf;
    size_t fbLen = fb -> len;
    for (size_t n = 0; n < fbLen; n = n + 1024) {
      if (n + 1024 < fbLen) {
        client.write(fbBuf, 1024);
        fbBuf += 1024;
      } else if (fbLen % 1024 > 0) {
        size_t remainder = fbLen % 1024;
        client.write(fbBuf, remainder);
      }
    }
    client.print(tail);

    esp_camera_fb_return(fb);

    int timoutTimer = 10000;
    long startTimer = millis();
    boolean state = false;
```

```
    while ((startTimer + timoutTimer) > millis()) {
      Serial.print(".");
      delay(100);
      while (client.available()) {
        char c = client.read();
        if (c == '\n') {
          if (getAll.length() == 0) {
            state = true;
          }
          getAll = "";
        } else if (c != '\r') {
          getAll += String(c);
        }
        if (state == true) {
          getBody += String(c);
        }
        startTimer = millis();
      }
      if (getBody.length() > 0) {
        break;
      }
    }
    Serial.println();
    client.stop();
    Serial.println(getBody);

    setWifiSleepMode(true);
  } else {
    getBody = "Connection to " + serverName + " failed.";
    Serial.println(getBody);
    client.stop();

    setWifiSleepMode(true);

  }
}

bool connectToWiFi() {
```

```
String activeSsid = "";
String activePassword = "";

if (activeConnection == 1) {
  activeSsid = ssid1;
  activePassword = password1;
} else if (activeConnection == 2) {
  activeSsid = ssid2;
  activePassword = password2;
}

Serial.print("Connecting to WiFi: ");
Serial.println(activeSsid);

WiFi.begin(activeSsid, activePassword);

while (WiFi.status() != WL_CONNECTED && wifiConnectionAttempts < 20) {
  delay(500);
  Serial.print(".");
  wifiConnectionAttempts++;
}

wifiConnectionAttempts = 0;

if (WiFi.status() == WL_CONNECTED) {
  Serial.println("\nConnected to WiFi");
  Serial.print("IP Address: ");
  Serial.println(WiFi.localIP());
  wifiConnected = true;

  EEPROM.begin(EEPROM_SIZE);
  EEPROM.write(eepromActiveConnection, activeConnection);
  EEPROM.commit();
  EEPROM.end();

  Serial.print("set activeConnection to : ");
  Serial.println(activeConnection);

  return true;
```

```
  } else {
    Serial.print("Connection to ");
    Serial.print(activeSsid);
    Serial.println(" failed. Trying alternative");
    return false;
  }
}

/**
 * set wifi sleep mode between data relays to conserve energy
 * @param sleepMode - if true set wifi card to sleep to conserve energy
 */
void setWifiSleepMode(bool sleepMode) {

  wifiSleeping = sleepMode;

  if (sleepMode) {
    WiFi.disconnect();
    WiFi.setSleep(true);
    delay(1000);
    Serial.print("sleep wifi status: ");
    Serial.println(wl_status_to_string(WiFi.status()));
  } else {
    WiFi.setSleep(false);
    WiFi.reconnect();
    delay(2000);
    Serial.print("awaken wifi status: ");
    Serial.println(wl_status_to_string(WiFi.status()));
    // Check if the connection is still active. if not trigger wait for it to come back online
    if (WiFi.status() != WL_CONNECTED && !wifiPaused) {
      Serial.println("Connection lost. Attempting to reconnect in 1 minute ...");
      WiFi.disconnect();
      wifiPaused = true;
      wifiConnected = false;
      connectToWiFi();
    }
  }
}

/**
```

```
 * record server ping success in long term memory
 */
void recordPingSucces() {
  totalServerPings++;
  EEPROM.begin(EEPROM_SIZE);
  EEPROM.writeFloat(eepromPingsAddress, totalServerPings);
  EEPROM.commit();
  EEPROM.end();
  wifiConnected = true;
  serverFailed = false;
}

/**
 * record server ping fails in long term memory
 */
void recordPingFailure() {
  totalServerPingFails++;
  EEPROM.begin(EEPROM_SIZE);
  EEPROM.writeFloat(eepromFailedPingsAddress, totalServerPingFails);
  EEPROM.commit();
  EEPROM.end();
  wifiConnected = false;
  serverFailed = true;
}

/**
 * ESP32 wifi card statuses
 * @param status
 * @return string
 */
String wl_status_to_string(wl_status_t status) {

  String response = "";

  switch (status) {
  case WL_NO_SHIELD:
    response = "WL_NO_SHIELD";
    break;
  case WL_IDLE_STATUS:
    response = "WL_IDLE_STATUS";
```

```
    break;
  case WL_NO_SSID_AVAIL:
    response = "WL_NO_SSID_AVAIL";
    break;
  case WL_SCAN_COMPLETED:
    response = "WL_SCAN_COMPLETED";
    break;
  case WL_CONNECTED:
    response = "WL_CONNECTED";
    break;
  case WL_CONNECT_FAILED:
    response = "WL_CONNECT_FAILED";
    break;
  case WL_CONNECTION_LOST:
    response = "WL_CONNECTION_LOST";
    break;
  case WL_DISCONNECTED:
    response = "WL_DISCONNECTED";
    break;
  }

  return response;
}
```

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