

# **M5Stack-TimerCamera saves images to Google Drive at regular and scheduled time**

- Time synchronization by NTP and regular/scheduled task
- Save to Google Drive using Google Cloud API

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## Past videos



《Watch videos on your smartphone  
[M5Stack TimerCamera]》  
[https://hobby-it.com/m5timer\\_webcam](https://hobby-it.com/m5timer_webcam)



《Google Cloud Cloud APIs [GoogleDrive for  
Arduino program]》  
<https://hobby-it.com/googledriveapi/>

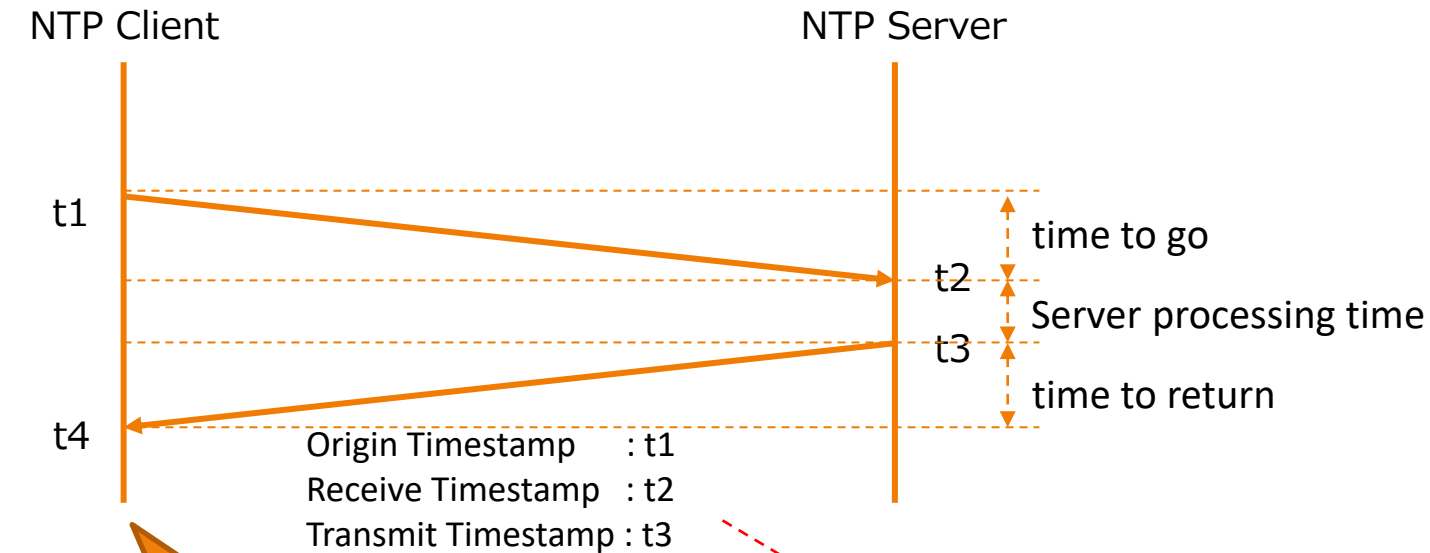
《Save JPEG image to GoogleDrive[API] with  
ESP32 and OV2640 (Software)》  
<https://hobby-it.com/save-jpeg-image-with-gdriveapi-3/>

# 4. About NTP

## ● Time synchronization with Windows 11 terminal

### ● NTP: Network Time Protocol

A protocol for network devices to automatically set the time



$$\text{Offset(Time lag)} = \frac{\text{time to go} \quad \text{time to return}}{2} = \frac{(t2-t1) - (t4-t3)}{2}$$

### 1) outgoing packet

ntp\_capture.pcapng

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	192.168.1.9	20.43.94.199	NTP	90	NTP Version 3, client
2	0.023148	20.43.94.199	192.168.1.9	NTP	90	NTP Version 3, server

Frame 1: 90 bytes on wire (720 bits), 90 bytes captured (720 bits) on interface \Device\NPF...  
 Ethernet II, Src: Tp-LinkT\_09:d6:7d (28:ee:52:09:d6:7d), Dst: Mitsubis\_86:d6:65 (10:4b:46:86:d6:65)  
 Internet Protocol Version 4, Src: 192.168.1.9, Dst: 20.43.94.199  
 User Datagram Protocol, Src Port: 123, Dst Port: 123  
 Network Time Protocol (NTP Version 3, client)  
 Flags: 0xdb, Leap Indicator: unknown (clock unsynchronized), Version number: NTP  
 [Response In: 2]  
 Peer Clock Stratum: unspecified or invalid (0)  
 Peer Polling Interval: 17 (131072 seconds)  
 Peer Clock Precision: 0.000000 seconds  
 Root Delay: 0.000000 seconds  
 Root Dispersion: 1.000000 seconds  
 Reference ID: NULL  
 Reference Timestamp: Jan 12, 2023 00:17:57.812058499 UTC  
 Origin Timestamp: NULL  
 Receive Timestamp: NULL  
 Transmit Timestamp: Feb 9, 2023 08:58:29.733061599 UTC

### 2) return packet

ntp\_capture.pcapng

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000	192.168.1.9	20.43.94.199	NTP	90	NTP Version 3, client
2	0.023148	20.43.94.199	192.168.1.9	NTP	90	NTP Version 3, server


Frame 2: 90 bytes on wire (720 bits), 90 bytes captured (720 bits) on interface \Device\NPF...  
 Ethernet II, Src: Mitsubis\_86:d6:65 (10:4b:46:86:d6:65), Dst: Tp-LinkT\_09:d6:7d (28:ee:52:09:d6:7d)  
 Internet Protocol Version 4, Src: 20.43.94.199, Dst: 192.168.1.9  
 User Datagram Protocol, Src Port: 123, Dst Port: 123  
 Network Time Protocol (NTP Version 3, server)  
 Flags: 0x1c, Leap Indicator: no warning, Version number: NTP Version 3, Mode: set  
 [Request In: 1]  
 [Delta Time: 0.023148000 seconds]  
 Peer Clock Stratum: secondary reference (3)  
 Peer Polling Interval: 17 (131072 seconds)  
 Peer Clock Precision: 0.000000 seconds  
 Root Delay: 0.002106 seconds  
 Root Dispersion: 0.029526 seconds  
 Reference ID: 25.00.230.0  
 Reference Timestamp: Feb 9, 2023 08:48:56.564738399 UTC  
 Origin Timestamp: Feb 9, 2023 08:58:29.733061599 UTC  
 Receive Timestamp: Feb 9, 2023 08:58:29.954736299 UTC  
 Transmit Timestamp: Feb 9, 2023 08:58:29.954739399 UTC

# 4. About NTP

1) has no time difference. 2) to 4) are 20 seconds behind


1) 15 seconds go and return

t1) 13:00 } go: 15 seconds  
 t2) 13:15 } (Server processing: 5 seconds)  
 t3) 13:20 } Return: 15 seconds  
 t4) 13:35 }

$$\frac{15 - 15}{2} = 0$$



2) 15 seconds go and return

t1) 13:00 } go: 15 seconds  
 t2) 13:35 } (Server processing: 5 seconds)  
 t3) 13:40 } Return: 15 seconds  
 t4) 13:35 }

$$\frac{35 - (-5)}{2} = 20$$



3) go is 5 seconds smaller

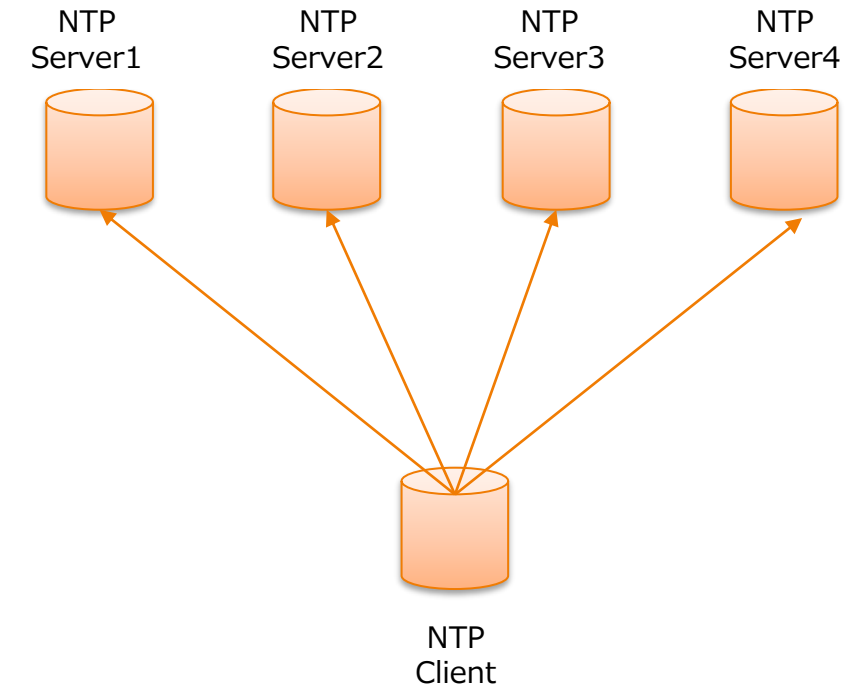
t1) 13:00 } go: 10 seconds  
 t2) 13:30 } (Server processing: 5 seconds)  
 t3) 13:35 } Return: 15 seconds  
 t4) 13:30 }

$$\frac{30 - (-5)}{2} = 17.5$$


4) return is 5 seconds smaller

t1) 13:00 } go: 15 seconds  
 t2) 13:35 } (Server processing: 5 seconds)  
 t3) 13:40 } Return: 10 seconds  
 t4) 13:30 }

$$\frac{35 - (-10)}{2} = 22.5$$




Improve accuracy by synchronizing time from 3 trusted servers

NTP assumes that the communication time is the same for going and returning

## 6. Arduino program

```
17 // #####_Line_Wi-Fi_settings_(Preferences)#####
18 String clientId      = "##### CLIENT-ID #####.apps.googleusercontent.com"; // $$$ CHANGE REQUIRED $$$
19 String clientSecret  = "##### CLIENT-SECRET #####"; // $$$ CHANGE REQUIRED $$$
20 String refreshToken  = "##### REFRESH-TOKEN #####"; // $$$ CHANGE REQUIRED $$$
21 String driveFolder   = "##### GOOGLE-FOLDER-ID ###"; // $$$ CHANGE REQUIRED $$$
22
23 const char *ssid     = "##### SSID #####"; // $$$ CHANGE REQUIRED $$$
24 const char *password = "### PASSWORD ###"; // $$$ CHANGE REQUIRED $$$
25
26 const int Interval   = 20; // Image save interval (minutes) [OFF:-1]
27 const int SavaTime   = 15; // Image save time (0 to 24 hours exactly) [OFF:-1]
28 // #####
29 const char* refreshServer = "oauth2.googleapis.com";
30 const char* refreshUri    = "/token";
31 const char* apiServer     = "www.googleapis.com";
32 const char* apiUri        = "/upload/drive/v3/files?uploadType=multipart";
33 String accessToken       = "";
34
35 int preMin = -1; // last run time(for Interval)
36 int preHour = -1; // last run time(for Time)
37
38 // LED Pin Setting
39 const byte LED_PIN = 2; // Green LED
..
```

Google and Wi-Fi  
settings

Must be changed

regular and scheduled time setting

Variables for saving  
the previous regular and scheduled time

```
141
142 // ##### NTP setting #####
143 configTime(9 * 3600L, 0, "ntp.nict.jp", "time.google.com", "ntp.jst.mfeed.ad.jp");
144
```

NTP settings  
(Set NTP server)

## 6. Arduino program

```
148 // Loop Function
149 void loop() {
150     struct tm timeInfoLoop;
151     getLocalTime(&timeInfoLoop);
152     bool doFlag = false;
153     // Check Interval
154     int curMin = -1;
155     if ( preMin <= timeInfoLoop.tm_min ) {
156         curMin = timeInfoLoop.tm_min;
157         // When time advances beyond 60 minute
158     } else {
159         curMin = timeInfoLoop.tm_min + 60;
160     }
161     // Check Interval time
162     if ( Interval > 0 && ( (curMin - preMin) >= Interval || preMin == -1 ) ) {
163         doFlag = true;
164         preMin = timeInfoLoop.tm_min;
165         Serial.print("Check Interval: ");
166         Serial.println(preMin);
167     }
168     // Check Time
169     if ( preHour != timeInfoLoop.tm_hour && SaveTime == timeInfoLoop.tm_hour && timeInfoLoop.tm_min == 0 ) {
170         doFlag = true;
171         preHour = timeInfoLoop.tm_hour;
172         Serial.print("Check Save Time: ");
173         Serial.println(preHour);
174     }
175     // Do Save Image to Google Drive
176     if ( doFlag ) {
177         // ##### Get JPEG picture #####
178         Serial.println("Start get JPG");
179         getCameraJPEG();
180         // ##### get Access Token #####
181         Serial.println("Start get AccessToken");
182         getAccessToken();
183         // ##### Save JPEG to GoogleDrive #####
184         Serial.println("Start Post GoogleDrive");
185         postGoogleDriveByAPI();
186     }
187     delay(1);
188 }
189
```

Get current time  
execution flag

To check the elapsed time in minutes,  
add 60 if it exceeds 0 minutes

Regular  
Startup  
check

Executed when the set value is positive  
and the elapsed time has passed  
since the previous time.  
(or if the previous time is -1)

Scheduled  
Startup  
check

Execute if the time has elapsed  
(different) from the previous time, is  
the same as the set value, and the  
minute is zero

Acquisition of images and execution of  
processing for saving to Google Drive



# 8. Operation check

The screenshot shows a Google Drive interface with a folder named "ESP32CAM\_FOLDER". The URL bar contains the folder ID "1JN...iBsN", which is highlighted by a red box and an orange callout box stating "Google Folder-ID (programmatically set)".

Name	Owner	Last modified	File size
M5TimerCam_20230210_150015.jpg	me	3:00 PM me	32 KB
M5TimerCam_20230210_152002.jpg	me	3:20 PM me	30 KB
M5TimerCam_20230210_154002.jpg	me	3:40 PM me	31 KB
M5TimerCam_20230210_160002.jpg	me	4:00 PM me	31 KB
M5TimerCam_20230210_162002.jpg	me	4:20 PM me	32 KB
M5TimerCam_20230210_164003.jpg	me	4:40 PM me	31 KB
M5TimerCam_20230210_170002.jpg	me	5:00 PM me	29 KB
M5TimerCam_20230210_172002.jpg	me	5:20 PM me	29 KB
M5TimerCam_20230210_174002.jpg	me	5:40 PM me	20 KB
M5TimerCam_20230210_180003.jpg	me	6:00 PM me	29 KB

The "Last modified" column is highlighted by a red box, and an orange callout box points to it with the text "Saved 15:00 and 20 minutes interval time".