Date Time Library Reference Manual

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Tue Jun 28 2016 19:48:35

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Chapter 1

Date Time Library

RTC and NTP Date and Time Library for MSP432, CC3200 and TM4C

Developed with embedXcode+

Author

Rei Vilc

http://embeddedcomputing.weebly.com

Date

18/07/2015 16:22

Version

403

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See also

ReadMe.txt for references

2 Date Time Library

Chapter 2

Class Index

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"	1	- (เเล	ee		ICT

Here are the classes, structs, unions and interfaces with brief descriptions:	
NateTime .	

Class Index

Chapter 3

File Index

3.1 File List

Here is a list of all documented files with brief descriptions:

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Library header	20

6 File Index

Chapter 4

Class Documentation

4.1 DateTime Class Reference

```
Class for RTC.
```

```
#include <RTC_Library.h>
```

Public Member Functions

• DateTime ()

Constructor.

• void begin ()

Initialisation.

• uint32_t getTime ()

Get GMT date and time.

• uint32_t getLocalTime ()

Get local date and time.

void setTime (uint32_t timeEpoch)

Set GMT date and time.

• void setTime (tm timeStructure)

Set GMT date and time.

void setTimeZone (int32_t timeZone=0)

Set time zone.

void setLocalTime (uint32_t timeEpoch)

Set local date and time.

• void setLocalTime (tm timeStructure)

Set local date and time.

4.1.1 Detailed Description

Class for RTC.

Note

Tested on MSP432-EMT, CC3200, LM4F120, TM4C123, TM4C129 For NTP features, see NTP_Ethernet and NTP_WiFi

8 Class Documentation

```
4.1.2 Member Function Documentation
4.1.2.1 uint32_t DateTime::getLocalTime()
Get local date and time.
Returns
     epoch = number of seconds since Jan 1st, 1970, uint32_t or time_t
Note
     Set the time zone with setTimeZone()
4.1.2.2 uint32_t DateTime::getTime()
Get GMT date and time.
Returns
     epoch = number of seconds since Jan 1st, 1970, uint32_t or time_t
4.1.2.3 void DateTime::setLocalTime ( uint32_t timeEpoch )
Set local date and time.
Parameters
 timeEpoch | time as epoch, number of seconds since Jan 1st, 1970
Note
     Set the time zone with setTimeZone()
4.1.2.4 void DateTime::setLocalTime ( tm timeStructure )
Set local date and time.
Parameters
 timeStructure
                 time as structure
Note
```

Set the time zone with setTimeZone()

4.1.2.5 void DateTime::setTime (uint32_t timeEpoch)

Set GMT date and time.

Parameters

timeEpoch | time as epoch, number of seconds since Jan 1st, 1970

4.1.2.6 void DateTime::setTime (tm timeStructure)

Set GMT date and time.

Parameters

timeStructure | time as structure

4.1.2.7 void DateTime::setTimeZone (int32_t timeZone = 0)

Set time zone.

Parameters

timeZone	difference in seconds between local time zone and GMT
----------	---

Note

Use pre-defined tz_CET, tz_CEST, tz_PST, tz_PDT, ...

The documentation for this class was generated from the following files:

- RTC_Library.h
- RTC_Library.cpp

10 **Class Documentation**

Chapter 5

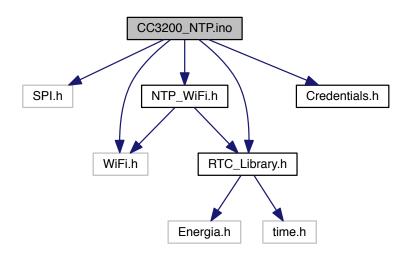
File Documentation

5.1 CC3200_NTP.ino File Reference

Example for NTP with CC3200 and MSP432.

```
#include <SPI.h>
#include <WiFi.h>
#include "RTC_Library.h"
#include "NTP_WiFi.h"
#include "Credentials.h"
```

Include dependency graph for CC3200_NTP.ino:



Functions

- void printWifiStatus ()
- uint32_t sendNTPpacket (IPAddress &address)
- void setup ()
- void loop ()

Variables

- DateTime myRTC
- time_t myEpochNTP
- time_t myEpochRTC
- tm myTimeNTP
- tm myTimeRTC
- uint32 t **counter** = 0
- bool flagRTC = true

5.1.1 Detailed Description

Example for NTP with CC3200 and MSP432.

Based on UDP NTP Client, part of Energia 16 distribution

- · Created 4 Sep 2010 by Michael Margolis
- Modified 9 Apr 2012 by Tom Igoe
- · Modified 1 July 2014 by Noah Luskey
- Updated July 19, 2015 by Rei Vilo

Developed with embedXcode+

Author

Rei Vilo

http://embeddedcomputing.weebly.com

Date

18/07/2015 16:22

Version

403

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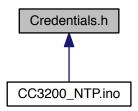
See also

ReadMe.txt for references

5.2 Credentials.h File Reference

Header.

This graph shows which files directly or indirectly include this file:



Variables

```
• char ssid [] = "ssid"
```

Network name of SSID.

• char password [] = "password"

Network password.

5.2.1 Detailed Description

Header.

Credentials for WiFi LAN

Project CC3200_NTP

Developed with embedXcode+

Author

Rei Vilo

http://embeddedcomputing.weebly.com

Date

19/07/2015 11:35

Version

101

Copyright

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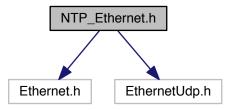
See also

ReadMe.txt for references

5.3 NTP_Ethernet.h File Reference

Library header.

```
#include <Ethernet.h>
#include <EthernetUdp.h>
Include dependency graph for NTP_Ethernet.h:
```



Macros

- #define ETHERNET_NTP_RELEASE 301
 Release.
- #define GET_NTP_SUCCESS 0

NTP error codes.

• #define GET_NTP_NO_CONNECTION 1

no connection

#define GET_NTP_DATA_ERROR 2

wrong data received

• #define GET_NTP_OTHER_ERROR 9

Functions

uint8_t getTimeNTP (time_t &epochNTP, IPAddress serverNTP=IPAddress(145, 238, 203, 14))
 Get date and time from NTP server.

5.3.1 Detailed Description

Library header.

Get date and time from NTP server through Ethernet

Project DateTimeLibrary_v2

Developed with embedXcode+

Author

Rei Vilo

http://embeddedcomputing.weebly.com

Date

Dec 22, 2015

Version

301

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See also

ReadMe.txt for references

- 5.3.2 Macro Definition Documentation
- 5.3.2.1 #define GET_NTP_OTHER_ERROR 9

other error

5.3.2.2 #define GET_NTP_SUCCESS 0

NTP error codes.

success

- 5.3.3 Function Documentation
- 5.3.3.1 uint8_t getTimeNTP (time_t & epochNTP, IPAddress serverNTP = IPAddress (145, 238, 203, 14))

Get date and time from NTP server.

Parameters

epochNTP	time in epoch format
serverNTP	IP address of the NTP server, default =

Returns

0 is successful, error code otherwise

Note

epochNTP is updated only if successful.

Warning

A valid connection to Internet is required.

Note

Examples of NTP servers

- time.nist.gov IPAddress(206,246,122,250)
- wwv.nist.gov IPAddress(24,56,178,140)
- ntp-p1.obspm.fr IPAddress(145,238,203,14)

```
1 time_t myEpoch;
2 result = getTimeNTP(myEpoch);
3 if (result == GET_NTP_SUCCESS) myDateTime.setTime(myEpoch);
```

Based on UDP NTP Client, provided with Energia 16

- · Created 4 Sep 2010 by Michael Margolis
- · Modified 9 Apr 2012 by Tom Igoe
- · Modified 1 July 2014 by Noah Luskey
- Updated July 19, 2015 by Rei Vilo with RTC for CC3200, MSP432, TM4C123 and TM4C129
- Updated Dec 22, 2015 by Rei Vilo as separate libraries for WiFi and Ethernet

See also

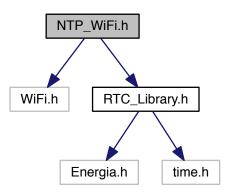
```
NTP time servers and messages
```

```
http://en.wikipedia.org/wiki/Network_Time_Protocol
```

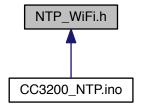
5.4 NTP_WiFi.h File Reference

Library header.

```
#include <WiFi.h>
#include "RTC_Library.h"
Include dependency graph for NTP_WiFi.h:
```



This graph shows which files directly or indirectly include this file:



Macros

- #define WIFI_NTP_RELEASE 301
 Release.
- #define GET_NTP_SUCCESS 0

NTP error codes.

• #define GET_NTP_NO_CONNECTION 1

no connection

• #define GET_NTP_DATA_ERROR 2

wrong data received

• #define GET_NTP_OTHER_ERROR 9

```
Functions
```

```
    uint8_t getTimeNTP (time_t &epochNTP, IPAddress serverNTP=IPAddress(145, 238, 203, 14))
    Get date and time from NTP server.
```

5.4.1 Detailed Description

Library header.

Get date and time from NTP server through WiFi

Project DateTimeLibrary_v2
Developed with embedXcode+

Author

Rei Vilo

http://embeddedcomputing.weebly.com

Date

Dec 22, 2015

Version

301

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See also

ReadMe.txt for references

5.4.2 Macro Definition Documentation

5.4.2.1 #define GET_NTP_OTHER_ERROR 9

other error

5.4.2.2 #define GET_NTP_SUCCESS 0

NTP error codes.

success

5.4.3 Function Documentation

5.4.3.1 uint8_t getTimeNTP (time_t & epochNTP, IPAddress serverNTP = IPAddress (145, 238, 203, 14))

Get date and time from NTP server.

Parameters

epochNTP	time in epoch format
serverNTP	IP address of the NTP server, default =

Returns

0 is successful, error code otherwise

Note

epochNTP is updated only if successful.

Warning

A valid connection to Internet is required.

Note

Examples of NTP servers

- time.nist.gov IPAddress(206,246,122,250)
- wwv.nist.gov IPAddress(24,56,178,140)
- ntp-p1.obspm.fr IPAddress(145,238,203,14)

```
1 time_t myEpoch;
2 result = getTimeNTP(myEpoch);
3 if (result == GET_NTP_SUCCESS) myDateTime.setTime(myEpoch);
```

Based on UDP NTP Client, provided with Energia 16

- · Created 4 Sep 2010 by Michael Margolis
- · Modified 9 Apr 2012 by Tom Igoe
- · Modified 1 July 2014 by Noah Luskey
- Updated July 19, 2015 by Rei Vilo with RTC for CC3200, MSP432, TM4C123 and TM4C129

See also

NTP time servers and messages

```
http://en.wikipedia.org/wiki/Network_Time_Protocol
```

Parameters

epochNTP	time in epoch format
serverNTP	IP address of the NTP server, default =

Returns

0 is successful, error code otherwise

Note

epochNTP is updated only if successful.

Warning

A valid connection to Internet is required.

Note

Examples of NTP servers

- time.nist.gov IPAddress(206,246,122,250)
- wwv.nist.gov IPAddress(24,56,178,140)
- ntp-p1.obspm.fr IPAddress(145,238,203,14)

```
1 time_t myEpoch;
2 result = getTimeNTP(myEpoch);
3 if (result == GET_NTP_SUCCESS) myDateTime.setTime(myEpoch);
```

Based on UDP NTP Client, provided with Energia 16

- · Created 4 Sep 2010 by Michael Margolis
- · Modified 9 Apr 2012 by Tom Igoe
- · Modified 1 July 2014 by Noah Luskey
- Updated July 19, 2015 by Rei Vilo with RTC for CC3200, MSP432, TM4C123 and TM4C129
- Updated Dec 22, 2015 by Rei Vilo as separate libraries for WiFi and Ethernet

See also

```
NTP time servers and messages
```

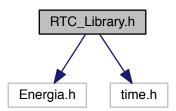
```
http://en.wikipedia.org/wiki/Network_Time_Protocol
```

5.5 RTC_Library.h File Reference

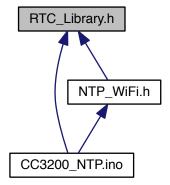
Library header.

```
#include "Energia.h"
#include "time.h"
```

Include dependency graph for RTC_Library.h:



This graph shows which files directly or indirectly include this file:



Classes

class DateTime

Class for RTC.

Macros

- #define RTC_Library_VERSION 403 Release.
- #define tz_GMT 0

Predefined time zones.

• #define tz_CUT 0

Coordinated Universal Time.

• #define tz_BST 1*60*60

British Summer Time.

• #define tz CET 1*60*60

Central Europe Time.

#define tz_CEST 2*60*60

Central Europe Summer Time.

• #define tz PST -8*60*60

Pacific Standard Time.

• #define tz_PDT -7*60*60

Pacific Daylight Time.

• #define tz CST -6*60*60

Central Standard Time.

• #define tz_CDT -5*60*60

Functions

• uint8_t convertString2DateTime (String stringDateTime, String stringFormat, time_t &timeEpoch)

Convert a string into date and time, epoch format.

uint8_t convertString2DateTime (String stringDateTime, String stringFormat, tm &timeStructure)

Convert a string into date and time, strcuture format.

• String convertDateTime2String (tm timeStructure)

Standard format for date and time string.

• String convertDateTime2String (time_t timeEpoch)

Standard format for date and time string.

String formatDateTime2String (const char *format, tm timeStructure)

Custom format for date and time.

String formatDateTime2String (const char *format, time_t timeEpoch)

Custom format for time.

• #define CONVERT SUCCESS 0

Conversion error codes.

- #define CONVERT_OTHER_ERROR 9
- void convertEpoch2Structure (time_t timeEpoch, tm &timeStructure)
- void convertStructure2Epoch (tm timeStructure, time_t &timeEpoch)

Convert structure into epoch.

5.5.1 Detailed Description

Library header.

RTC Date and Time Library for LM4F / TM4C, MSP432 and CC3200

Note

Use NTP_Ethernet or NTP_WiFi for getting NTP time

Project RTC_Library

Developed with embedXcode+

```
Author
     Rei Vilo
     http://embeddedcomputing.weebly.com
Date
     Jun 28, 2016
Version
     403
Copyright
     (c) Rei Vilo, 2015-2016
     CC = BY SA NC
See also
     ReadMe.txt for references
     http://www.epochconverter.com
5.5.2 Macro Definition Documentation
5.5.2.1 #define CONVERT_OTHER_ERROR 9
other error
5.5.2.2 #define CONVERT_SUCCESS 0
Conversion error codes.
success
5.5.2.3 #define tz_CDT -5*60*60
Central Daylight Time
5.5.2.4 #define tz_GMT 0
Predefined time zones.
Difference in seconds to GMT/CUT
CET = 3600 = GMT + 1 hourGreenwich Mean Time
```

5.5.3 Function Documentation

5.5.3.1 String convertDateTime2String (tm timeStructure)

Standard format for date and time string.

Parameters

timeStructure time	e as structure
--------------------	----------------

Returns

formated string

Note

Sun Jul 19 18:55:13 2015

5.5.3.2 String convertDateTime2String (time_t timeEpoch)

Standard format for date and time string.

Parameters

timeEnoch	time as epoch
unicepoon	unic as opocin

Returns

formated string

Note

Sun Jul 19 18:55:13 2015

5.5.3.3 void convertEpoch2Structure (time_t timeEpoch, tm & timeStructure)

Utilities.

There are 2 representation for data and time.

• Epoch

POSIX time = number of seconds since 00:00 Jan 1st, 1979

Structure

The MSP432 has its own not compatible structure!

MSP432 specific structure	Standard C structure
struct _RTC_C_Calendar	struct tm
{	{
uint_fast8_t seconds;	int tm_sec; // seconds after the minute [0-60]
uint_fast8_t minutes;	int tm_min; // minutes after the hour [0-59]
uint_fast8_t hours;	int tm_hour; // hours since midnight [0-23]
uint_fast8_t dayOfWeek;	(*)

MSP432 specific structure	Standard C structure
uint_fast8_t dayOfmonth;	int tm_mday; // day of the month [1-31]
uint_fast8_t month;	int tm_mon; // months since January [0-11]
uint_fast16_t year;	int tm_year; // years since 1900
(*)	int tm_wday; // days since Sunday [0-6]
	int tm_yday; // days since January 1 [0-365]
	int tm_isdst; // Daylight Savings Time flag
	long tm_gmtoff; // offset from CUT in seconds
	char *tm_zone; // timezone abbreviation
};	};

Convert epoch into structure

Parameters

timeEpoch	time as epoch, input
timeStructure	time as structure, output

5.5.3.4 uint8_t convertString2DateTime (String stringDateTime, String stringFormat, time_t & timeEpoch)

Convert a string into date and time, epoch format.

Parameters

stringDateTime	date and time as string, input
stringFormat	string format, input, see below
timeEpoch	time as epoch, output

Returns

0 if success, otherwise error code

5.5.3.5 uint8_t convertString2DateTime (String stringDateTime, String stringFormat, tm & timeStructure)

Convert a string into date and time, strcuture format.

Parameters

stringDateTime	date and time as string, input
stringFormat	string format, input, see below
timeStructure	time as strcuture, output

Returns

0 if success, otherwise error code

5.5.3.6 void convertStructure2Epoch (tm timeStructure, time_t & timeEpoch)

Convert structure into epoch.

Parameters

timeStructure	time as time structure, input
timeEpoch	time as epoch, output

5.5.3.7 String formatDateTime2String (const char * format, tm timeStructure)

Custom format for date and time.

Parameters

format	see below
timeStructure	time as structure

Returns

formated string

5.5.3.8 String formatDateTime2String (const char * format, time_t timeEpoch)

Custom format for time.

Parameters

format	see below
timeEpoch	time as epoch

Returns

formated string

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