Date Time Library Reference Manual

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Contents

Chapter 1

Date Time Library

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

Developed with embedXcode+

Author

Rei Vilo
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Date

18/07/2015 16:22

Version

403

See also

ReadMe.txt for references

Chapter 2

Class Index

2.1 Class List

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

Chapter 3

File Index

3.1 File List

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

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

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

Chapter 5

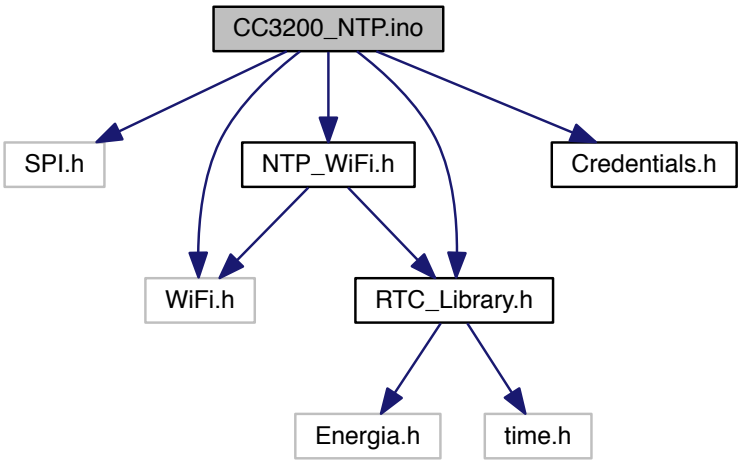
File Documentation

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

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http://embeddedcomputing.weebly.com

Date

18/07/2015 16:22

Version

403

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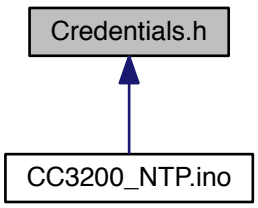
ReadMe.txt for references

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+

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Date

19/07/2015 11:35

Version

101

Copyright

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See also

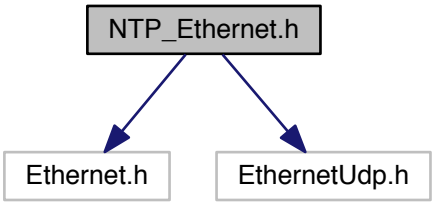
ReadMe.txt for references

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

Copyright

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

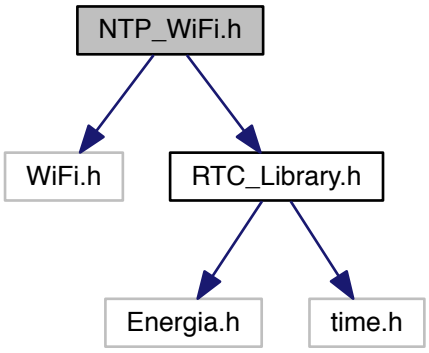
NTP time servers and messages
http://en.wikipedia.org/wiki/Network_Time_Protocol

5.4 NTP_WiFi.h File Reference

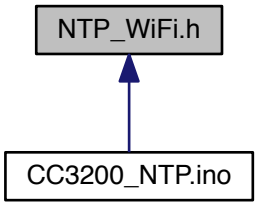
Library header.

```
#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

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- Updated Dec 22, 2015 by Rei Vilo as separate libraries for WiFi and Ethernet

See also

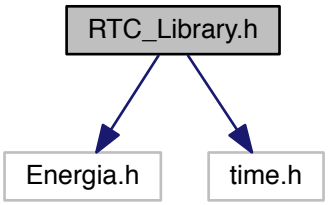
NTP time servers and messages
http://en.wikipedia.org/wiki/Network_Time_Protocol

5.5 RTC_Library.h File Reference

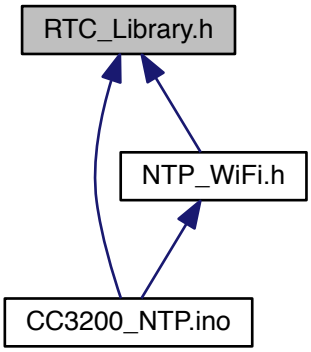
Library header.

```
#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)

  Utilities.
- 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

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 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

timeEpoch	time as epoch

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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