

iChip Network-Time Client

Theory of Operation

Version 1.01

Pub. No.: 19-1700-00

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Introduction

The NTP (Network Time Protocol) is the standard protocol to retrieve accurate time-of-day from the Internet. A multitude of steady and permanent NTP servers exist on the net, available for time-of-day acquisition. The NTP protocol is the preferred method to retrieve time-of-day because of its standardization and wide public availability of servers. It is also guaranteed to return the correct time. iChip actually implements SNTP (Simple NTP).

Utilization in iChip

Two primary utilizations currently exist for iChip:

1. Timestamp outgoing Email messages. When sending an email, should time be successfully retrieved from a Time Server, a "Date:" field will be included in the Email message's header.

Example:

Date: Mon, 17 Nov 2003 11:19:13 +0200

2. Provide the current local time, upon request, to the host. This time can be obtained by issuing an "AT+iRP8" command to the iChip. iChip will return the current time, in the following format (according to ISO 8601): YYYY-MM-DDT HH:MM:SS TZD, where TZD is the Time Zone Designator +hh:mm or -hh:mm. If no time has been retrieved, an all zeros response shall be returned – 0000-00-00T00:00:00 TZD.

Example:

Send

AT+iRP8

To iChip

iChip's response shall be:

2003-11-17T11:19:13+02:00

I/OK

iChip can maintain a software time of day clock while power is applied, using its internal resources, after preliminarily acquiring the actual time from the network. In other words, while power is on, iChip can keep correct time and date after going on-line and retrieving the timestamp from an SNTP server.

How does it work?

Once iChip gets an IP address – either by establishing a PPP connection in the case of iModem, or using DHCP in the case of iLan – iChip will address the time server specified in the NTS1 parameter. Should iChip fail to retrieve a reply from this server within 30 seconds, iChip will turn to NTS2 and try retrieving time from it. Should the NTS2 time server also fail to reply within 30 seconds, iChip will go back to NTS1. This process will continue until the time is successfully retrieved from a time server.

iChip parameters

1. NTS – Network Time Servers.

iChip parameters will allot for up to two SNTP servers, Primary SNPT and Secondary SNPT. SNTP server names may be symbolic or IP addresses.

AT+iNTSn=<SNTP server name>, where n ~ [1..2].

2. GMT0 – Greenwich Meant Time Offset.

NTP timestamps are generated relative to UTC/GMT (Greenwich Mean Time). Therefore, in order to determine local time, the GMT offset for the current location needs to be programmed in iChip.

AT+iGMT0=<value>, where <value> ~ [-12 ... 12]

3. DSTD – Daylight Savings Time Definition.

Many countries use DST (Daylight Savings Time), which adds an additional hour to the standard GMT offset during summer time. There is no single rule for DST transition dates around the world. Nor is there an Internet protocol that supplies DST dates around the world. Therefore, this parameter shall be left to the user.

DST is added to the GMT offset when calculating local time. Therefore, DST=0 during winter and =1 during summer.

The best option for a DST parameter setting is a configuration string that defines a DST rule. With this method it will not be required to change the DST setting twice a year. A simple DST rule defines two dates where DST transitions occur. During the summer transition DST is incremented from 0 → 1 and during the winter transition it is decremented from 1 → 0. The DST rule shall be defined as follows:

AT+iDSTR=<DST transition rule>, where

<DST transition rule> = “HH1.DD1.MM1/1,HH2.DD2.MM2/0”

HHn = Full Hour (2 digits).

DDn = Either specific day (2 digits), or <F/L><Day of Week>.

<F/L> - F = First, L = Last Day of the month.

<Day of Week> - {“Sun”, “Mon”, “Tue”, “Wed”, “Thu”, “Fri”, “Sat”}.

For example: Fsun will indicate the First Sunday of the month.

MMn = Month.

4. NTOD – Network Time of Day activation flag.

iChip SNTP client may be activated or deactivated. The NTOD (Network Time of Day) parameter defines if Network time acquisition is required or not.

AT+iNTOD=<f>, where f ~ [0..1]. Default is 0 (No network time acquisition).

Once network time is acquired, local time will be calculated and a local-time variable is maintained by accumulating the iChip’s internal ticks. During each new Internet session, network time acquisition overrides the existing local-time variable. If time acquisition fails for both the primary and secondary NTP servers, no error shall be returned to the host. An internal iChip flag will be raised so that the response to the local-time report command (see following) will return with an I/ERROR.

The local-time variable will be referenced to stamp outgoing Emails and reporting local time to the host.

List of some time servers

Name	Address location
time-a.nist.gov	NIST, Gaithersburg, Maryland
time-b.nist.gov	NIST, Gaithersburg, Maryland
time-a.timefreq.bldrdoc.gov	NIST, Boulder, Colorado
time-b.timefreq.bldrdoc.gov	NIST, Boulder, Colorado

time-c.timefreq.bldrdoc.gov	NIST, Boulder, Colorado
utcnist.colorado.edu	University of Colorado, Boulder
time.nist.gov	NCAR, Boulder, Colorado
time-nw.nist.gov	Microsoft, Redmond, Washington
nist1.datum.com	Datum, San Jose, California