Strategy / Algorithm for Converting Local times to UTC times

A local time will be specified with a time zone, but, except in a corner case, without the indication of whether daylight savings time is in effect. (That corner case involves the ambiguous times, immediately after the transition from daylight savings time back to standard time. For example, if there is a shift back one hour at 2:00 a.m., there is a second occurrence of the times between 1:00 a.m. and 2:00 a.m..)

We will store for each time zone, the rule transition datetimes. That is, the datetime when a new rule takes effect.

The first rule for each time zone will start from the beginning of time and extend until a transition datetime. Prior to the advent of formal time zones, cities generally used some version of local mean solar time. The time differed from GMT by an amount related to the longitude of the city, and generally did not differ by an integral number of hours. For many time zones, the first rule will be of this form and referred to as LMT, or Local Mean Time.

The rule transition datetimes will be computed from the IANA files, and always stored in local wall clock time prior to the transition. This will provide the simplest algorithm to identify the applicable rule for a specified local datetime. In the time zone files, most transition times are specified as local wall clock times, though some are specified as local “standard” time and others are specified as universal time. The latter two will need to be converted to local wall clock times during the processing of the files.

Take an example where a new rule for the transition to daylight savings time takes effect on January 1, 1982 at 00:00:00.

EXTENDED EXAMPLE

Here is an extended example of zic input, intended to illustrate many

of its features.

# Rule NAME FROM TO TYPE IN ON AT SAVE LETTER/S

Rule Swiss 1941 1942 - May Mon>=1 1:00 1:00 S

Rule Swiss 1941 1942 - Oct Mon>=1 2:00 0 -

Rule EU 1977 1980 - Apr Sun>=1 1:00u 1:00 S

Rule EU 1977 only - Sep lastSun 1:00u 0 -

Rule EU 1978 only - Oct 1 1:00u 0 -

Rule EU 1979 1995 - Sep lastSun 1:00u 0 -

Rule EU 1981 max - Mar lastSun 1:00u 1:00 S

Rule EU 1996 max - Oct lastSun 1:00u 0 -

# Zone NAME GMTOFF RULES/SAVE FORMAT UNTIL

Zone Europe/Zurich 0:34:08 - LMT 1853 Jul 16

0:29:46 - BMT 1894 Jun

1:00 Swiss CE%sT 1981

1:00 EU CE%sT

Link Europe/Zurich Switzerland

In this example, the zone is named Europe/Zurich but it has an alias as

Switzerland. This example says that Zurich was 34 minutes and 8

seconds west of UT until 1853-07-16 at 00:00, when the legal offset was

changed to 7o26'22.50''; although this works out to 0:29:45.50, the

input format cannot represent fractional seconds so it is rounded here.

After 1894-06-01 at 00:00 Swiss daylight saving rules (defined with

lines beginning with "Rule Swiss") apply, and the UT offset became one

hour. From 1981 to the present, EU daylight saving rules have applied,

and the UTC offset has remained at one hour.

In 1941 and 1942, daylight saving time applied from the first Monday in

May at 01:00 to the first Monday in October at 02:00. The pre-1981 EU

daylight-saving rules have no effect here, but are included for

completeness. Since 1981, daylight saving has begun on the last Sunday

in March at 01:00 UTC. Until 1995 it ended the last Sunday in

September at 01:00 UTC, but this changed to the last Sunday in October

starting in 1996.

For purposes of display, "LMT" and "BMT" were initially used,

respectively. Since Swiss rules and later EU rules were applied, the

display name for the time zone has been CET for standard time and CEST

for daylight saving time.