On the various ways of getting the current time and date in Win32

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There are a number of functions in Win32 that obtain the current date and time. Here's how they fit together:

The starting point is `GetSystemTimeAsFileTime`. This returns the current time in UTC in the form of a `FILETIME` structure. This also happens to be the time format used internally by the system, so this value can be retrieved with a minimum of fuss.

You can also call `GetSystemTime` which returns the current UTC time in the form of a `SYSTEMTIME` structure. To do this, the operating system takes the current `FILETIME` and then calls the moral equivalent of `FileTimeToSystemTime`, which does a boatload of gnarly math to decompose the `FILETIME` into year, month, day, hour, minute, second, and millisecond.

Meanwhile, you can also get the current local time by taking the `FILETIME` returned by `GetSystemTimeAsFileTime`, then passing it to `FileTimeToLocalFileTime`.

And finally, there's `GetLocalTime`, which does the same thing as `GetSystemTime`, but it starts with the local file time.

In equations:

Format	Time zone	Function	Algorithm	
FILETIME	UTC	GetSystem-TimeAsFileTime	(Native format)	
FILETIME	Local	(None)	GetSystemTimeAsFileTime + FileTimeToLocalFileTime	
SYSTEM-TIME	UTC	GetSystem-Time	GetSystemTimeAsFileTime	+ FileTimeToSystemTime

I happen to be a fan of commutative diagrams. (Though since there are no closed loops, there is nothing to commute.)

A 2-by-2 grid of boxes. The top row is labeled FILETIME; the bottom row is labeled SYSTEMTIME. The first column is labeled UTC; the second column is labeled Local. The upper left box is labeled GetSystemTimeAsFileTime. There is an outgoing arrow to the right labeled FileTimeToLocalFileTime leading to the box in the second column labeled None. There is an outgoing arrow downward labeled FileTimeToSystemTime leading to the box in the second row, first column, labeled GetSystemTime. From the box in the upper right corner labeled None, there is an outgoing arrow downward labeled FileTimeToSystemTime leading to the box in the second row, second column, labeled GetLocalTime.

UTC

Local

FileTime

GetSystemTimeAsFileTime

FileTimeToLocalFileTime

(None)

FileTimeToSystemTime

FileTimeToSystemTime

SYSTEMTIME

GetSystemTime

GetLocalTime

→

↓

↓

To complete the commutative diagram, there would be an arrow connecting the bottom two boxes called `SystemTimeToLocalTime`, but there is no such function.

Today's article was inspired by some code I ran across which did this:

```
SYSTEMTIME stNow;
FILETIME ftNow;
GetSystemTime(&stNow);
SystemTimeToFileTime(&stNow, &ftNow);
```

That code unwittingly takes an excursion from `GetSystemTimeAsFileTime` through `File-TimeToSystemTime` to `GetSystemTime`, then back through `SystemTimeToFileTime&shy` to return to `GetSystemTimeAsFileTime`, just so that it can end up where it started, but with a lot of extra math (and loss of resolution).

Exercise: How would you implement the `SystemTimeToLocalTime` function?

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