

Add an interface to query resolution of time bases v3 Proposal for C2x

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We propose the inclusion of a query function for time resolution that is modelled after ISO 9945's `clock_getres`.

History: This is one part of a follow-up of N2402 and N2417, which had been denied adequate treatment in the Ithaca 2019 meeting of WG14.

1. INTRODUCTION

The interfaces in `time.h` to manipulate time values have grown mostly unattended over the years and present several problems that could be easily avoided with more modern, redesigned interfaces. This paper is concerned with the following problem:

- The function `timespec_get` has a resolution for which there is no query interface.

2. STRATEGY

C17 has no interface that would allow to query the resolution of the `TIME_UTC` time. Because of the genericity of `timespec_get`, the interface to query resolutions should not be a series of macros:

- User functions may have a time base as a parameter, so they cannot decide at compile time which resolution would be to query.
- The resolution may not be part of the platform ABI. *E.g* it may be dependent of a particular version of the CPU or operating system.
- The resolution for a specific time base should not change during program execution. Therefore performance critical code can easily cache these values at program startup or thread startup if they need to.

ISO 9945 has a function that is capable to capture resolutions of predefined bases and also of all implementation-defined bases, the `clock_getres` function. This function has the following properties:

- The resolution of a given time base is dynamic and not guaranteed to be the same for all executions. It is only guaranteed to be stable per POSIX process.
- The resolution is returned via a pointer parameter to a `timespec`. This allows to model time bases with a resolution that exceeds the second.
- The pointer parameter is allowed to be null. This allows to use that function just as a query interface for the existence of the corresponding time base.

As the C17 function `timespec_get` has been modeled after `clock_gettime`, we propose to model such a function, `timespec_getres`, accordingly after `clock_getres`.

3. IMPLEMENTATION EXPERIENCE

The `clock_getres` function is present on all systems that conform to ISO 9945:2009 or newer. For POSIX versions before that it had been present if the “times” option had been supported.

To accommodate the API changes that C11 had inflicted to `clock_gettime` we just propose a change in the API that goes along the same lines.

4. PROPOSED WORDING

Add a new clause to 7.27.2 as follows:

7.27.2.X The timespec_getres function

Synopsis

```
#include <time.h>
int timespec_getres(struct timespec *ts, int base);
```

Description

If `ts` is non-null and `base` is supported by the `timespec_get` function, the `timespec_getres` function returns the resolution of the time provided by the `timespec_get` function for `base` in the `timespec` structure pointed to by `ts`. For each supported `base`, multiple calls to `clock_getres` during the same program execution shall have identical results.

Returns

If the value `base` is supported by the `timespec_get` function, the `timespec_getres` function returns the nonzero value `base`; otherwise, it returns zero.