

# Open Issues in `std::execution::task`



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## Abstract

`std::execution::task` (P3552R3<sup>[1]</sup>) had open issues identified by national ballot comments, LEWG issues, and published papers. Croydon resolved several. This paper classifies each issue by whether it can be resolved after C++26 ships or whether shipping forecloses the fix, and notes which classified issues were addressed at Croydon.

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## Revision History

### R2: April 2026 (post-Croydon mailing)

- Updated classification to reflect Croydon motions 28-29, 33, 35-38. Acknowledged issues resolved by P3941R4, P3927R2, P3980R1, and P4151R1. Rewrote allocator descriptions to credit P3980R1 while preserving residual frame-allocator concerns.

- Reference corrections.

## R1: March 2026 (prior to Croydon meeting)

- Complete rewrite as an informational classification of open issues.

## R0: February 2026 (pre-Croydon mailing)

- Original analysis of structural gaps. See [P4007R0](#)<sup>[2]</sup>.
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## 1. Disclosure

The author provides information and serves at the pleasure of the committee.

Coroutine-native I/O and `std::execution` are complementary. Each serves the domain where its design choices pay off.

The authors developed [P4007R0](#)<sup>[2]</sup> ("Senders and Coroutines") and [P2583R3](#)<sup>[3]</sup> ("Symmetric Transfer and Sender Composition"). The classification below holds regardless of whether any alternative design exists.

This paper asks for nothing.

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## 2. Fixed After Ship

`task`'s `promise_type` is a class template instantiated in user code. Its `operator new`, allocator selection, stop token storage, environment forwarding, and destruction ordering can change between standard revisions without binary incompatibility. These issues are fixable post-ship: [Unusual Allocator Customisation](#)<sup>[4]</sup>, [Flexible Allocator Position](#)<sup>[4]</sup>, [Shadowing The Environment Allocator](#)<sup>[4]</sup>, [Stop Source Always Created](#)<sup>[4]</sup>, [Stop Token Default Constructible](#)<sup>[4]</sup>, [Task Not Actually Lazily Started](#)<sup>[4]</sup>, [Frame Destroyed Too Late](#)<sup>[4]</sup>, [No Default Arguments](#)<sup>[4]</sup>, [unhandled\\_stopped Not noexcept](#)<sup>[4]</sup>, [Environment Design Inefficient](#)<sup>[4]</sup>, [Non-Sender Awaitables Unsupported](#)<sup>[4]</sup>, [Future Language Feature Could Avoid `co\_yield`](#)<sup>[4]</sup>, [No TLS Capture/Restore Hook](#)<sup>[4]</sup>, [return\\_value/return\\_void Have No Specification](#)<sup>[4]</sup>, [co\\_return { args... } Unsupported](#)<sup>[4]</sup>, [change\\_coroutine\\_scheduler Requires Assignable Scheduler](#)<sup>[4]</sup>, [Sender-Unaware Coroutines Cannot `co\_await` a task](#)<sup>[4]</sup>, [Missing Rvalue Qualification](#)<sup>[4]</sup>, [Parameter Lifetime Is Surprising](#)<sup>[5]</sup>, [No Protection Against Dangling References](#)<sup>[5]</sup>, [co\\_yield with\\_error Is Clunky](#)<sup>[5]</sup>, [co\\_await schedule\(sch\) Is an Expensive No-Op](#)<sup>[5]</sup>, [Coroutine Cancellation Is Ad-Hoc](#)<sup>[5]</sup>.

Of these, Croydon resolved six: Unusual Allocator Customisation, Flexible Allocator Position, and Shadowing The Environment Allocator were addressed by [P3980R1](#)<sup>[6]</sup>; `unhandled_stopped Not noexcept`, `change_coroutine_scheduler Requires Assignable Scheduler` (the mechanism was removed entirely), and Missing Rvalue Qualification were addressed by [P3941R4](#)<sup>[13]</sup>. The remaining issues are still open and fixable post-ship.

`affine` semantics (formerly `affine_on`, renamed by [P4151R1](#)<sup>[14]</sup>), rescheduling behavior, and algorithm customization are specification-level concerns. Tightening requirements or adding default implementations does not change any published interface. These issues are fixable post-ship: [affine\\_on Default Implementation Lacks Specification](#)<sup>[4]</sup>, [affine\\_on Semantics](#)

Not Clear<sup>[4]</sup>, `affine_on` Shape May Not Be Correct<sup>[4]</sup>, `affine_on` Shouldn't Forward Stop Requests<sup>[4]</sup>, `affine_on` Customisation For Other Senders<sup>[4]</sup>, Starting a `task` Reschedules Unconditionally<sup>[4]</sup>, Resuming After a `task` Reschedules Unnecessarily<sup>[4]</sup>, `bulk` vs. `task_scheduler`<sup>[4]</sup>, No Completion Scheduler<sup>[4]</sup>, `with_awaitable_senders` Unused<sup>[4]</sup>.

Of these, Croydon resolved eight. P3941R4<sup>[13]</sup> rewrote scheduler affinity from scratch - `affine_on` was made unary, `change_coroutine_scheduler` removed, and `get_start_scheduler` introduced - resolving the five `affine_on/affine` items and both rescheduling items. P4151R1<sup>[14]</sup> renamed `affine_on` to `affine`. P3927R2<sup>[15]</sup> resolved `bulk` vs. `task_scheduler` by giving `task_scheduler` parallel bulk support. Two items remain open: No Completion Scheduler and `with_awaitable_senders` Unused.

### 3. Not Fixable Post-Ship

The issues in this section are items where shipping forecloses the fix.

Issue	References	Fixed
Allocator Timing	P3980R1 <sup>[6]</sup> , P3796R1 <sup>[4]</sup> , LWG 4356 <sup>[7]</sup> , US 254-385 <sup>[8]</sup>	partial
Allocator Propagation	P3980R1 <sup>[6]</sup> , P3796R1 <sup>[4]</sup>	partial
Error Return	P3950R0 <sup>[9]</sup> , P3801R0 <sup>[5]</sup> , P1713R0 <sup>[10]</sup>	no
Symmetric Transfer	P2583R3 <sup>[3]</sup> , US 246-373 <sup>[11]</sup> , LWG 4348 <sup>[12]</sup> , P3801R0 <sup>[5]</sup> , P3796R1 <sup>[4]</sup>	no

- **Allocator Timing.** P3980R1<sup>[6]</sup> separates frame allocation from environment allocation: the environment allocator is now sourced from `get_allocator(get_env(rcvr))` at `connect` time, resolving environment-based injection. The frame allocator, however, remains call-site-specified via `allocator_arg` in the coroutine parameter list. This is a structural consequence of coroutine allocation timing - the frame is allocated by `operator new` before `connect/start` runs, so the receiver's environment is unavailable. Shipping standardizes the two-tier split. A design where frame allocation participates in environment-based propagation is foreclosed without a language change to coroutine allocation.
- **Allocator Propagation.** P3980R1<sup>[6]</sup> provides environment allocator propagation: each `task` obtains its environment allocator from `get_allocator(get_env(rcvr))`, so a parent's environment allocator flows to children through the receiver chain. Frame allocator propagation remains absent. Each coroutine call site must independently specify `allocator_arg` to use a non-default frame allocator. In a deep coroutine call tree where frame allocation matters - arena-per-request, pool allocators, device memory - every function signature must carry `allocator_arg` explicitly. Shipping this design forecloses automatic frame allocator propagation through the coroutine call tree.
- **Error Return.** `task` requires `co_yield with_error(e)` to propagate an error to the caller. `co_return` cannot carry an error value because `return_value` and `return_void` are mutually exclusive in the current coroutine specification. Shipping this interface locks in the `co_yield` mechanism and forecloses `co_return`-based error propagation, which would require a language change.
- **Symmetric Transfer.** The completion functions (`set_value`, `set_error`, `set_stopped`) and `start()` return `void`, providing no channel to propagate a `coroutine_handle<>`. When a sender completes synchronously, the receiver calls `handle.resume()`

on the caller's stack, adding a frame per completion with no upper bound. Shipping this protocol forecloses the `coroutine_handle<>`-returning completion protocol that would enable symmetric transfer.

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## References

Papers, issues, and ballot comments referenced in this document.

### WG21 Papers

- [1] [P3552R3](#) - "Add a Coroutine Task Type" (Dietmar Kühl, Maikel Nadolski, 2025).
- [2] [P4007R0](#) - "Senders and Coroutines" (Vinnie Falco, Mungo Gill, 2026).
- [3] [P2583R3](#) - "Symmetric Transfer and Sender Composition" (Mungo Gill, Vinnie Falco, 2026).
- [4] [P3796R1](#) - "Coroutine Task Issues" (Dietmar Kühl, 2025).
- [5] [P3801R0](#) - "Concerns about the design of `std::execution::task`" (Jonathan Müller, 2025).
- [6] [P3980R1](#) - "Task's Allocator Use" (Dietmar Kühl, 2026).
- [7] [LWG 4356](#) - "`connect()` should use `get_allocator(get_env(rcvr))`".
- [8] [US 254-385](#) - C++26 NB ballot comment.
- [9] [P3950R0](#) - "`return_value` & `return_void` Are Not Mutually Exclusive" (Robert Leahy, 2025).
- [10] [P1713R0](#) - "Allowing both `co_return`; and `co_return` value; in the same coroutine" (Lewis Baker, 2019).
- [11] [US 246-373](#) - C++26 NB ballot comment.
- [12] [LWG 4348](#) - "task doesn't support symmetric transfer".

### Croydon Papers (R2)

- [13] [P3941R4](#) - "Scheduler Affinity" (Dietmar Kühl, 2026).
- [14] [P4151R1](#) - "Rename `affine_on`" (Robert Leahy, 2026).
- [15] [P3927R2](#) - "task\_scheduler Bulk Execution" (Eric Niebler, 2026).