

Wording for class template argument deduction from inherited constructors

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Abstract

This paper provides wording for class template argument deduction from inherited constructors. See [\[P1021R6\]](#) for rationale.

1 Proposed wording

The proposed changes are relative to the C++ working draft [\[N4910\]](#).

In [\[over.match.class.deduct\]](#), append to paragraph 1 as follows:

except that additional parameter packs of the form $P_j \dots$ are inserted into the parameter list in their original aggregate element position corresponding to each non-trailing aggregate element of type P_j that was skipped because it was a parameter pack, and the trailing sequence of parameters corresponding to a trailing aggregate element that is a pack expansion (if any) is replaced by a single parameter of the form $T_n \dots$.

In addition, if C is defined and inherits constructors ([\[namespace.udecl\]](#)) from a direct base class denoted in the *base-specifier-list* by a *class-or-decltype* B , let A be an alias template whose template parameter list is that of C and whose *defining-type-id* is B . If A is a deducible template ([\[dcl.type.simple\]](#)), the set contains the guides of A with the return type R of each guide replaced with `typename CC<R>::type` given a class template

`template <typename> class CC;`

whose primary template is not defined and with a single partial specialization whose template parameter list is that of A and whose template argument list is a specialization of A with the template argument list of A ([\[temp.dep.type\]](#)) having a member typedef `type` designating a template specialization with the template argument list of A but with C as the template.

[*Note:* Equivalently, the template parameter list of the specialization is that of C , the template argument list of the specialization is B , and the member typedef names C with the template argument list of C . — end note]

In [over.match.class.deduct], add the following example:

[*Example:*

```
template <typename T> struct B {
    B(T);
};

template <typename T> struct C : public B<T> {
    using B<T>::B;
};

template <typename T> struct D : public B<T> {};

C c(42); // OK, deduces C<int>
D d(42); // Error: deduction failed, no inherited deduction guides

B(int) -> B<char>;
C c2(42); // OK, deduces C<char>

template <typename T> struct E : public B<int> {
    using B<int>::B;
};

E e(42); // Error: deduction failed, arguments of E cannot be deduced from guides introduced

template <typename T, typename U, typename V> struct F {
    F(T, U, V);
};

template <typename T, typename U> struct G : F<U, T, int> {
    using G::F::F;
}

G g(true, 'a', 1); // OK, deduces G<char, bool>
— end example]
```

In [over.match.best.general], insert as follows:

- F1 and F2 are rewritten candidates, and F2 is a synthesized candidate with reversed order of parameters and F1 is not [*Example:*

```
struct S {
    friend std::weak_ordering operator<=>(const S&, int); // #1
    friend std::weak_ordering operator<=>(int, const S&); // #2
};
bool b = 1 < S(); // calls #2
```

— end example] or, if not that,

- F1 and F2 are generated from class template argument deduction ([over.match.class.deduct]) for a class D, and F2 is generated from inheriting constructors from a base class of D while F1 is not, and for each explicit function argument, the corresponding parameters of F1 and F2 are either both ellipses or have the same type, or, if not that,
- F1 is generated from a *deduction-guide* ([over.match.class.deduct]) and F2 is not, or, if not that,

2 Known issues

The mechanism for class template argument deduction from inherited constructors proposed here relies on the existing mechanism for class template argument deduction from alias templates. Core issue [CWG2467] should be expanded to include additional instances of the problem introduced by this paper.

Document history

- **R0**, 2022-05-15: Initial version.
- **R1**, 2022-05-20: Wording changes following CWG review.

Acknowledgements

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References

- [CWG2467] Richard Smith. Core Defect 2467: CTAD for alias templates and the deducible check. https://www.open-std.org/jtc1/sc22/wg21/docs/cwg_active.html#2467, 2019-08-12 (accessed 2022-05-20).
- [N4910] Thomas Köppe. Working Draft, Standard for Programming Language C++. <http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2022/n4910.pdf>, 2022-03-17.
- [P1021R6] Mike Spertus, Timur Doumler, and Richard Smith. Filling holes in Class Template Argument Deduction. <http://www.open-std.org/jtc1/sc22/wg21/docs/papers/2022/p1021r6.html>, 2022-05-15.