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Title:	Dependent Static Assertion
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I. Introduction

We need to introduce a generic solution to create the dependent scope for static_assert(false) expression where it is semantically necessary.

II. Motivation and Scope

In several scenarios static_assert(false) expression is a useful construction. That happens when better diagnostics should be provided to the user. However, if implementer just writes false as the first argument of the static_assert the program has never been compiled successfully.

Consider the following examples where such semantics can be useful:

Suppose the user have to implement the function with the signature:

```
template <typename T>
int my func(const T&)
```

and it is necessary to implement it in accordance with the following requirements:

- If T is integral type, returns 1
- Otherwise if T is convertible to std::string, returns 2
- Otherwise the program is ill-formed.

Possible implementation might be:

```
template <typename T>
int my_func(const T&)
{
    if constexpr(std::is integral v<T>)
    {
        return 1;
    }
    else if constexpr (std::is_convertible_v<std::string, T>)
    {
        return 2;
    }
    else
    {
        // Always Compile-time error
        static assert(false, "T is not integral and is not
                               convertible to std::string");
    }
}
```

But as mentioned above this code cannot be compiled successfully due to static_assert(false) expression.

Another example where static_assert(false) might be useful is the class template for which primary template is not defined. Instead, user should always pass correct template arguments that one of specializations has been chosen.

Consider the following code snippet:

```
// Primary template
template <typename T, typename U>
struct my_struct;
// Partial specialization
template <typename T, typename Alloc>
struct my_struct<int, std::vector<T, Alloc>>
{
    ;
    // User code
int main()
{
        my_struct<int, int> s;
}
```

Examples of compiler messages are:

- Clang: error: implicit instantiation of undefined template 'my_struct<int, int>'
- GCC: error: aggregate 'my_struct<int, int> s' has incomplete type and cannot be defined
- Intel Compiler: error: incomplete type is not allowed my_struct<int, int> s;

Implementer might want to provide better diagnostics to the user. The possible approach might be:

};

Unfortunately, the static assertion in the code above is always failed despite if primary template has been chosen or not.

III. Problem statement

To overcome the mentioned issue the implementer should write some implementation to create dependent scope for the static assert(false) expression.

Possible implementation:

```
template <typename T>
```

```
constexpr bool always_false()
{
   return false;
}
template <typename T, typename U>
struct my_struct
{
   // static_assert fails only if primary template is chosen
   static_assert(always_false<T>());
};
```

Many template libraries implement the approach above in their manner. It's better to have one standard solution instead of having a lot of workarounds everywhere implemented differently.

IV. Proposal

The issue may be addressed by introducing the generic solution for such problem.

Introduce new syntax for static assert with optional angle brackets:

```
static_assert<T>( bool_constexpr , message )
```

```
static_assert<T>( bool_constexpr )
```

that would not be calculated unless entered the dependent scope.

In that case the static assert would look like either:

```
template <typename T, typename U>
struct my_struct
{
    static_assert<T>(false);
};
```

A dependent static assertion is created with help of optional template parameter. It would be evaluated only if primary template is chosen.

The proposed API should work with all:

- Type template parameters
- Non-type template parameters
- Variadic template parameters

For convenience it also may work with variadic templates pack but it is optional

V. Additional notes

Another parallel paper (P1830R1) that tries to solve this problem on the library level is submitted.

Unfortunately, it cannot fulfill all use-case since it is hard to impossible to support all combinations of template template parameters in the dependent scope.

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