

Section 2.1 C++11

Braced Init

Employing **direct initialization**, e.g., `x0` in the code snippet below, selects the most appropriate constructor, regardless of whether it is **declared** to be **explicit**, and successfully uses that one; employing **copy initialization**, e.g., `x1`, drops explicit constructors from the **overload set** before determining a best match; and employing **copy list initialization**, e.g., `x2`, again includes all constructors in the **overload set** but is ill formed if the selected constructor is **explicit**:

```
Q x0(0);      // OK, direct initialization calls Q(int).
Q x1 = 1;    // OK, copy initialization calls Q(T).
Q x2 = {2};  // Error, copy list initialization selects but cannot call Q(int).
Q x3{3};    // Same idea as x0; direct list initialization calls Q(int).
```

In other words, the presence of the `=` coupled with the braced notation, e.g., `x2` in the code example above, forces the compiler to choose the constructor *as if* it were **direct initialization**, e.g., `x0`, but then forces a compilation failure if the selected constructor turns out to be **explicit**. This “consider-but-fail-if-selected” behavior of **copy list initialization** is analogous to that of functions **declared** using `= delete`; see Section 1.1. “Deleted Functions” on page 53. Using braces but omitting the `=` (e.g., `x3`) puts us back in the realm of **direct** rather than **copy initialization**; see *Direct list initialization* on page 228.

When initializing references, **copy list initialization**, i.e., braced syntax, behaves similarly to **copy initialization**, i.e., no braces, with respect to the generation of **temporaries**. For example, when using a braced list to initialize an lvalue reference, e.g., `int& ri` or `const int& cri` in the code example below, to a scalar of a type that exactly matches it (e.g., `int i`), no **temporary** is created, just as it would not have been without the braces; otherwise, a **temporary** will be created, provided that a viable conversion exists and is not narrowing:

```
#include <cassert> // standard C assert macro

void test()
{
    int i = 2;          assert(i == 2);
    int& ri = { i };   assert(&ri == &i); // OK, no temporary created
    ri = 3;           assert(i == 3); // Original i is affected.

    const int& cri = { i }; assert(&cri == &i); // OK, no temporary created
    ri = 4;           assert(cri == 4); // Other reference is affected.

    short s = 5;       assert(s == 5);
    const int& crs = { s }; assert(&crs != &s); // OK, temporary is created.
    s = 6;             assert(crs == 5); // Temporary is unchanged.

    long j = 7;        assert(j == 7);
    const int& crj = { j }; // Error, narrowing conversion from long to int
}
```

As evidenced by the C-style asserts in the example above, no **temporary** is created when initializing either `ri` or `cri` since modifying the reference affects the **variable** supplied as the