

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

    const int& cri = { i };
    ri = 4;
    assert(cri == 3); // OK, no temporary created
    assert(cri == 4); // Other reference is affected.

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

    long 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