Make direct-initialization for enumeration types at least as permissive as direct-list-initialization.
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1. Introduction

Recent history of enum initialization

- P0138R2: Construction Rules for enum class Values (C++17)
- P0960R3: Allow initializing aggregates from a parenthesized list of values (C++20)
- “What about parenthesized initialization of enumerations?“

Status quo

```cpp
enum class E {};
E a{0};  // OK, direct-list-initialization
E{0};   // OK, direct-list-initialization
E(0);   // OK, function-style cast
E b = 0; // error: cannot convert ‘int’ to ‘E’ in initialization
E c(0); // error: cannot convert ‘int’ to ‘E’ in initialization
new E(0); // error: cannot convert ‘int’ to ‘E’ in initialization
```
2. Motivation

Teachability issues

• Intuition violation:
  • “Direct-list-init is direct-init, but without narrowing conversions.“
• Enumeration initialization is inconsistent with ...
  • class type initialization
  • arithmetic type initialization

Don’t repeat yourself

```cpp
std::vector<std::byte> bytes;
bytes.emplace_back(0xff);  // ill-formed
bytes.emplace_back(std::byte{0xff});  // OK, but DRY violation
```
3. Proposal

Wording

In [dcl.init.general], define direct-initialization for enumerations exactly like direct-list-initialization, except that narrowing conversions don’t matter.

• (As a consequence, direct-init is defined in terms of static_cast.)

Editorial changes to [dcl.init.list] for enumerations:

• itemize (prose to bullets)
• define T{...} in terms of static_cast<T>(...) instead of T(...)

TODO: Feature-detection macro?
4. Impact/Design

Questions

- "Is existing code affected?"
  - Only expression testing (SFINAE, etc.)
- "What about enums without fixed underlying types?"
  - No changes, direct-init remains *ill-formed* (consistent with direct-list-init)
- "Should implicit conversions to enums be allowed in general?"
  - No!

Dubious side effect

```cpp
std::byte b(1000.f); // OK ?!
```
References

Jan Schultke; P3087: Make direct-initialization for enumeration types at least as permissive as direct-list-initialization (latest revision)

Gabriel Dos Reis; P0138R2: Construction Rules for enum class Values
https://www.open-std.org/jtc1/sc22/wg21/docs/papers/2016/p0138r2.pdf

Ville Voutilainen, Thomas Köppe; P0960R3: Allow initializing aggregates from a parenthesized list of values