C++ Club Meeting 100

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Prague Trip Reports

- Bryce Lelbach et al.
  - 252 attendees! 23 subgroups! 9 tracks!
  - **C++20** is done!
  - **C++23** roadmap! **Standard library modules**; **library support for coroutines**; **executors**; **networking**. Also: reflection; pattern matching; contracts.
- Herb Sutter
  - Reddit
- CppCast with Hana Dusíková
  - YouTube

C++20 is here

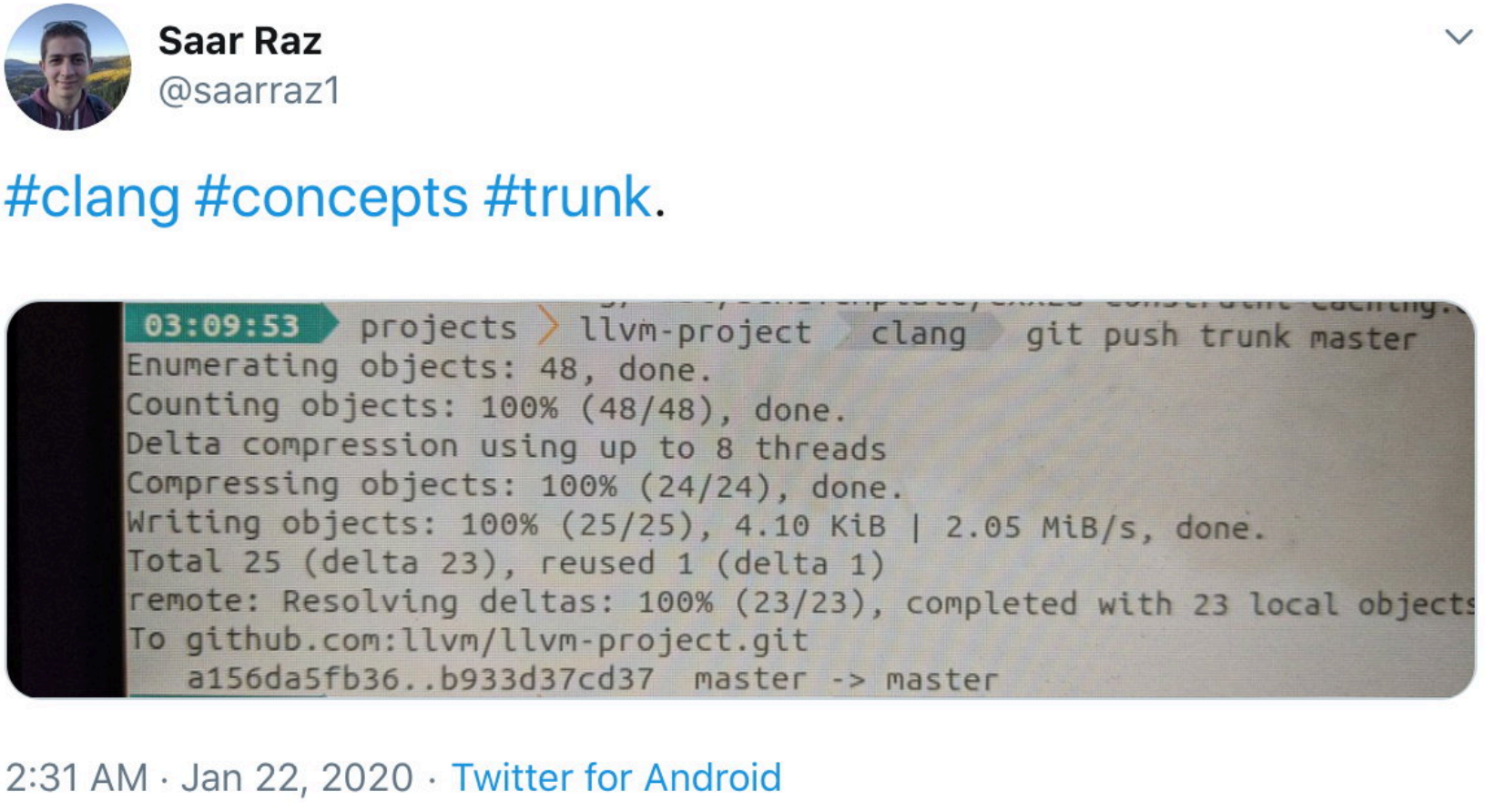
- Video
- Reddit

- Reddit

Comment:

> *I work in a large codebase that was originally written in C and was compiled with C++03 just a few years ago. Since then, we have upgraded through C++11, C++14 and are now using C++17. So far, my experience is that every upgrade has been almost exclusively a positive experience, and each version has made it easier to write safe and expressive code.*

Concepts pushed to Clang master



- Reddit

[C++ coroutines] Initial implementation pushed to GCC master

- Message
- Reddit

> *This is not enabled by default (even for **-std=c++2a**), it needs **-fcoroutines***

- Audio
- Video

> *There's a misunderstanding (of contracts in the C++ committee – GD) that's not easy to appreciate if you're not a real day-to-day software engineer. That is what derailed contracts. I will fix it. I promise you, I will fix it.*

Follow-up: Aggregates

From CppReference: An aggregate is one of the following types:

- array type
- class type (typically, `struct` or `union`), that has
  - no private or protected *direct* (since C++17) non-static data members
  - no *user-declared constructors* (until C++11)
  - no *user-provided constructors* (explicitly defaulted or deleted constructors are allowed) (since C++11) (until C++17)
  - no *user-provided, inherited, or explicit constructors* (explicitly defaulted or deleted constructors are allowed) (since C++17) (until C++20)
  - no *user-declared or inherited constructors* (since C++20)
  - no virtual, private, or *protected* (since C++17) base classes
  - no virtual member functions
  - no *default member initializers* (since C++11) (until C++14)

Structured Exceptions (Win32) and C++

- Raymond Chen: How can I handle both structured exceptions and C++ exceptions potentially coming from the same source?
  - Reddit
- Raymond Chen: Can I throw a C++ exception from a structured exception?

“Making new friends” idiom by Dan Saks

Wikibooks

> *The goal is to simplify creation of friend functions for a class template.*

```
1  template<typename T>
2  class Foo {
3     T value;
4  public:
5     Foo(const T& t) { value = t; }
6     friend ostream& operator <<(ostream& os, const Foo<T>& b)
7     {
8        return os << b.value;
9     }
10 };
```

A new decade, a new tool: libman

- Colby Pike (vector-of-bool)
- Reddit
- GitHub
- Specification

libman is a new level of indirection between package management and build systems.

dds is Drop-Dead Simple build and package manager.

- CppCon 2019: Robert Schumacher “How to Herd 1,000 Libraries”

A hidden gem: `inner_product` (1/2)

- Article

A hidden gem: `inner_product` (2/2)

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Conor Hoekstra @code_report
@cjdb_ns & @TartanLlama

This makes me so incredibly happy! I literally just yesterday googled, C++17 / C++20 zip to see if they had anything, because I wrote some code in both C++ and #Python and Python was so much more beautiful.

```
int solve(int h, vector<int> w, vector<int> l) {
    int p = 0;
    for (int i = 0; i < w.size(); ++i)
        p = max(p, w[i] - l[i] / 4);
    return max(0, p - h);
}
```

```
def solve(h, w, l):
    p = max(a - b//4 for a, b in zip(w, l))
    return max(0, p - h)
```

29w • 03/12/2018 • 17:47

Conor Hoekstra @code_report
@cjdb_ns & @TartanLlama

Also, I just discovered std::inner_product - a beautiful temporary solution to a lack of zip. #cpp #inner_product

```
int solve(int h, vector<int> w, vector<int> l) {
    return max(0, inner_product(begin(w), end(w), begin(l), 0,
        [](auto a, auto b) { return max(a, b); },
        [](auto a, auto b) { return a - b / 4; }) - h);
}
```

27w • 16/12/2018 • 09:30

- Article

Twitter: Pure virtual function syntax (1/2)

Shafik Yaghmour @shafikyaghmour

Rereading “The Design and Evolution of C++”

= 0

syntax was used for pure virtual function in order to avoid having to add a new keyword such as pure or abstract because the feature was added close to the next release.

Twitter: Pure virtual function syntax (2/2)

13.2.3 Syntax

The curious `=0` syntax was chosen over the obvious alternative of introducing a keyword `pure` or `abstract` because at the time I saw no chance of getting a new keyword accepted. Had I suggested `pure`, Release 2.0 would have shipped without abstract classes. Given a choice between a nicer syntax and abstract classes, I chose abstract classes. Rather than risking delay and incurring the certain fights over `pure`, I used the traditional C and C++ convention of using `0` to represent "not there." The `=0` syntax fits with my view that a function body is the initializer for a function and also with the (simplistic, but usually adequate) view of the set of virtual functions being implemented as a vector of function pointers (§3.5.1). In fact, `=0` is not best implemented by putting a `0` in the `vtbl`. My implementation places a pointer to a function called `__pure_virtual_called` in the `vtbl`; this function can then be defined to give a reasonable run-time error.

I chose a mechanism for specifying individual functions pure rather than a way of declaring a complete class abstract because the pure virtual function notion is more flexible. I value the ability to define a class in stages; that is, I find it useful to define some virtual functions and leave the definition of the rest to further derived classes.

Move, simply

- Herb Sutter

> *The state of `a` after it has been moved from is the same as the state of `a` after any other non-const operation. Move is just another non-constfunction that might (or might not) change the value of the source object.*

- Daniel Martin

EnTT

A header-only, tiny and easy to use library for game programming and much more written in modern C++, mainly known for its innovative entity-component-system (ECS) model.

- GitHub (C++17, MIT)
- Reddit

Favourite “You can do that in C++?! Neat!” moments

Reddit

Range-for loops, fold expressions, streams, template definition in .cpp file, RAII, operator overloading, function/constructor `try` block, placement `new`, structured bindings, taking address of a label, variadic templates, overloading `operator,`, algorithms, and many more.

Quote

Oscar Godson:

> *One of the best programming skills you can have is knowing when to walk away for a while.*

Rust is better than C++20, by David Sankel

David Sankel, “We Have C++20” bloopers:

> *(C++) is like Rust, but worse.*

Operator:

> *What’s better about Rust?*

David Sankel:

> *I don’t know, I haven’t actually used Rust.*