

C++ Club Meeting Notes

Gleb Dolgich

2018-04-26

ACCU Conf 2018 (2018-04-10-2018-04-14) Trip Reports

- ▶ [JetBrains](#), by Anastasia Kazakova (PMM for C++ Tools), Timur Doumler (Software Developer in the CLion team) and Phil Nash (JetBrains C++ tools Developer Advocate)
- ▶ [Felix Petriconi](#)
- ▶ [Mathieu Ropert](#)
- ▶ [Arne Mertz](#)

C++17 - The Best Features - Nicolai Josuttis (ACCU 2018)

- ▶ YouTube
- ▶ Reddit

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C++17 A Header-Only ::new Tracker

```
class TrackNew
{
private:
    inline static int numMalloc = 0;    // number of ::new or ::new[] calls
    inline static long sumSize = 0;     // bytes allocated so far
    inline static bool doTrace = false; // tracing enabled
public:
    static void trace(bool b) { // enable/disable tracing
        doTrace = b;
    }
    static void status() { // print current state
        std::cerr << numMalloc << " mallocs for " << sumSize << " Bytes" << '\n';
    }
    static void* allocate(std::size_t size, const char* call) { // implementation of
        tracked_allocation
        ++numMalloc;
        sumSize += size;
        if (doTrace) ...
        return std::malloc(size);
    }
};

inline void* operator new (std::size_t size) {
    return TrackNew::allocate(size, "::new");
}
...
```

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C++17: Compile-Time if

```
template <typename T>
std::string asString(T x)
{
    if constexpr(std::is_arithmetic_v<T>) {
        return std::to_string(x);
    }
    else if constexpr(std::is_same_v<T, std::string>) {
        return x;
    }
    else {
        return std::string(x);
    }
}
std::cout << asString(42) << '\n';
std::cout << asString(std::string("hello")) << '\n';
std::cout << asString("hello") << '\n';
```

All example calls would be invalid when using run-time if



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Polymorphism Example with std::variant<>

• no pointers
• no new/delete in appl. code
• objects located together

• no common base class
• no virtual functions

~~GeoObj~~

~~Circle~~

~~Line~~

```
class Circle {
private:
    Coord center;
    int rad;
public:
    Circle (Coord c, int r);
    void move(Coord c);
    void draw() const;
};

class Line {
private:
    Coord from;
    Coord to;
public:
    Line (Coord f, Coord t);
    void move(Coord c);
    void draw() const;
};

using GeoObjVar = std::variant<Circle, Line>;
std::vector<GeoObjVar> createFig()
{
    std::vector<GeoObjVar> f;
    f.push_back(Line(Coord(1,2),Coord(3,4)));
    f.push_back(Circle(Coord(5,5),2));
    return f;
}

void drawElems (const std::vector<GeoObjVar>& v)
{
    for (const auto& geobj : v) {
        std::visit([](const auto& obj) {
            obj.draw();
        }, geobj);
    }
}

std::vector<GeoObjVar> fig = createFig();
drawElems(fig);
for (auto& geobj) : fig) {
    std::visit([](auto& obj) {
        obj.move(Coord(2,2));
    }, geobj);
}
drawElems(fig);
fig.clear(); // remove all elements in the vector
```

visitor uses a local variable

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A photograph of Nicolai Josuttis, a man with glasses and a blue jacket, speaking at a conference. He is gesturing with his right hand. In the background, there is a painting on the wall.

C++17 - The Best Features - Nicolai Josuttis (ACCU 2018) (cont.)

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C++17: std::variant<> Visitors

```
std::variant<Circle, Line> var;  
...  
  
template<typename... Functors>  
struct Ovld : Functors... {  
    using Functors::operator()...; // derive op() from all functors  
};  
// deduce template arguments from initializers:  
template<typename... Functors> Ovld(Functors...) -> Ovld<Functors...>;  
  
std::visit(Ovld{ [](Circle c) {  
        std::cout << "Circle " << c << '\n';  
    },  
    [](Line l) {  
        std::cout << "Line " << l << '\n';  
    }  
},  
var);
```



C++17 - The Best Features - Nicolai Josuttis (ACCU 2018) (cont.)

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C++17: std::variant<...> Visitors
C++17 Features:
• std::variant<...>
• Aggregates can have base classes
• Deduction guides for class template arguments

```
std::variant<Circle, Line> var;
...
template<typename... Functors>
struct Ovld : Functors... {
    using Functors::operator()...; // derive op() from all functors
};
// deduce template arguments from initializers:
template<typename... Functors> Ovld(Functors...) -> Ovld<Functors...>

std::visit(Ovld{[] (Circle c) {
    std::cout << "Circle " << c << '\n';
},
[] (Line l) {
    std::cout << "Line " << l << '\n';
}
},
var);
```

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Using transform_reduce()

```
#include <numeric> // for transform_reduce()
#include <execution> // for the execution policy
...
void printDirSize(const std::string& dir)
{
    // init paths with all paths from directory dir:
    std::vector<std::filesystem::path> paths;
    std::filesystem::recursive_directory_iterator dirpos(dir);
    std::copy(begin(dirpos), end(dirpos),
              std::back_inserter(paths));

    // sum size of regular files:
    auto sz = std::transform_reduce(
        std::execution::par, // parallel execution policy (opt)
        paths.cbegin(), paths.cend(), // range
        std::uintmax_t(0), // initial value (and return type)
        std::plus<>(),
        [] (const std::filesystem::path& p) { // ... file size if regular file
            return is_regular_file(p) ? file_size(p)
                                      : std::uintmax_t(0);
        });
    std::cout << "sum of size of regular files: " << sz << '\n';
}

```

Can't pass directory iterator to parallel algorithms, because they require forward iterators

Call lambda for each element and accumulate results

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A photograph of Nicolai Josuttis, a man with glasses and a beard, wearing a blue jacket over a grey t-shirt, standing on stage and speaking into a microphone. He is gesturing with his hands as he speaks. The background shows wooden paneling.

C++17 - The Best Features - Nicolai Josuttis (ACCU 2018) (cont.)

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Uniform Initialization now Almost Done

```
int i2 = 0;           // "copy initialization" (from C)
int i3(0);           // "direct initialization" (since C++98)
int i4(0);           // "direct initialization" from Modern C++ (since C++11)
int i5 = {0};         // "copy initialization" from Modern C++  
  
unsigned long l1(-17);      // ERROR (good!): "narrowing" detected
unsigned long l2(4.8);       // ERROR (good!): "narrowing" detected
std::vector<int> v1(0, 15); // self explanatory (unlike v1(0,15))  
  
auto x{42};            // x is int since C++17 (was std::initializer_list<int> before C++17)
auto y{0,8,15};          // ERROR since C++17 (good!) (was std::initializer_list<int> before C++17)
auto z = {0,8,15};       // OOPS: still std::initializer_list<int>  
  
enum class MyIntegralEnum;
MyIntegralEnum e(17);    // OK since C++17 (all other initializations are still ill-formed)  
  
struct CData {
    int amount;
    double value;
};
struct DData : CData {
    std::string name;
    void print() const;
};
DData a({42, 6.7}, "book"); // C++17: initialize all elems  
  
intType t1();           // "value initialization" (default value or 0/false/nullptr for FDTs)
int t16();               // initialized with 0 (since C++11)
DData b();               // same as: {0,0.0,""}  
MyIntegralEnum f();     // still OK
```

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VCPkg, now for Linux and macOS

- ▶ [Post](#)
- ▶ [Reddit](#), [Reddit](#)

{fmt}

- ▶ Website
- ▶ GitHub

code::dive 2017 - John Lakos - Value semantics: It ain't about the syntax!

► Video

2. Understanding Value Semantics

Where is “Value” Defined?

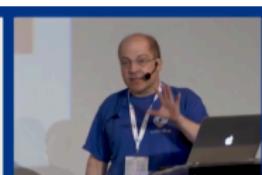
`operator==`

The associated, homogeneous (free) `operator==` for a type T

Implementation

1. Provides an *operational definition* of what it means for two objects of type T to have “the same” *value*.
2. **Defines** the *salient attributes* of T as those attributes whose respective values must **compare equal** in order for two instances of T to compare equal.

Interface/Contract



A video frame showing John Lakos, a man with glasses and a blue shirt, speaking at a conference. He is gesturing with his hands while speaking. A laptop is visible on the desk in front of him. The background shows other people and conference equipment.

code::dive 2017 - John Lakos - Value semantics: It ain't about the syntax! (cont.)

2. Understanding Value Semantics

"Value Types" having Value Semantics

A C++ type that “properly” represents (a subset of) the values of an abstract “mathematical” type is said to have **value semantics**.



code::dive 2017 - John Lakos - Value semantics: It ain't about the syntax! (cont.)

The screenshot shows a mobile device displaying a video player interface. At the top, there's a navigation bar with icons for back, forward, and search. Below it, the title of the video is visible: "cs - It ain't about the syntax! code::dive conference - 20171126 - code - -dive 2017 - J H/W". The main content area contains a slide with the following text:

What to Remember about VSTs

The key take-away:

- What makes a value-type *proper*
- has essentially nothing to do with *syntax*; it has everything to do with *semantics*: A class that respects the **Essential Property of Value** is value-semantic...

At the bottom of the slide, there's a progress bar indicating the video is at 1:35:18 and has 586 seconds remaining. The video player also includes standard controls for volume, brightness, and orientation.

Reddit: Why is modern C++ seemingly not being taught?

- ▶ [Reddit](#)

Reddit: Why is C++ so hated?

- ▶ Reddit

C++ in Zircon (Fuchsia OS kernel)

- ▶ [Readme](#)

Brigand - Instant compile time C++11 metaprogramming library

- ▶ [GitHub](#) (header-only, Boost Software License 1.0)
- ▶ [Docs](#)
- ▶ [Meeting C++ 2015 video](#)
- ▶ [CppCon 2016 video](#)
- ▶ [Ebook](#)

Everything you were doing with Boost.MPL can be done with Brigand.

Brigand - Instant compile time C++ 11 metaprogramming library (cont.)

- ▶ Example tasks:
 - ▶ Create a tuple from a list of types and then transform it into a variant
 - ▶ Look for the presence of a type in a tuple and get its index
 - ▶ Sort a list of types
 - ▶ Advanced static assertion with arithmetics and complex functions
 - ▶ Go through a list of types and perform a runtime action for each type

Raspberry Pi - Install Clang 6 and compile C++17 programs

► Post

FoundationDB and Flow by Apple

► Post

Flow, a new programming language that brings actor-based concurrency to C++11. Flow is implemented as a compiler which analyzes an asynchronous function (actor) and rewrites it as an object with many different sub-functions that use callbacks to avoid blocking. The Flow compiler's output is normal C++11 code, which is then compiled to a binary using traditional tools. Flow also provides input to our simulation tool, which conducts deterministic simulations of the entire system, including its physical interfaces and failure modes. In short, Flow allows efficient concurrency within C++ in a maintainable and extensible manner.

C++ Patterns

[Website](#)

Twitter

 T045TBR0T
@t045tbr0t

↑ 1 Reply, 99 Quotes



finally, a monitor that will fit the entire name of my Java classes

10/03/2018, 00:57 (Saturday)

Twitter for Android

Retweeted by [@lenoir_aaron](#)

10/03/2018, 20:44

19024 Likes

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Thread >

