

Learning and Teaching Modern C++

 @arne_mertz

So what is "Modern C++"?



Meeting C++

@meetingcpp

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@meetingcpp

So what is "Modern C++"?

13% new standards + boost

52% new standards \geq C++11

21% ask Alexandrescu

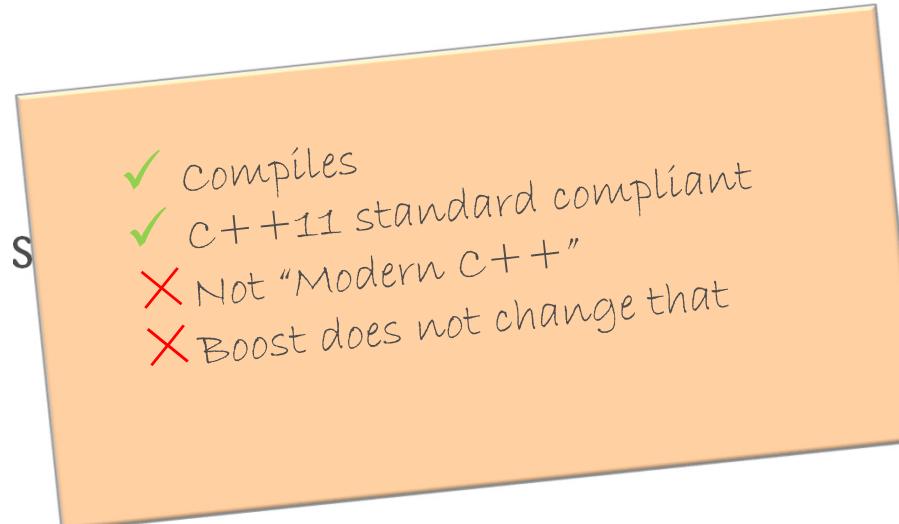
14% using C++ to its fullest

375 votes • Final results

The (new) standards define what is possible

Not what is good

- Free-standing new and delete
- void*
- int array[]
- “C with classes”
- Everything into classes, Java s

- 
- ✓ Compiles
 - ✓ C++11 standard compliant
 - ✗ Not “Modern C++”
 - ✗ Boost does not change that



Meeting C++

@meetingcpp

So what is "Modern C++"?

~~10%~~ new standards + boost

~~52%~~ new standards \geq C++11

21% ask Alexandrescu

14% using C++ to its fullest

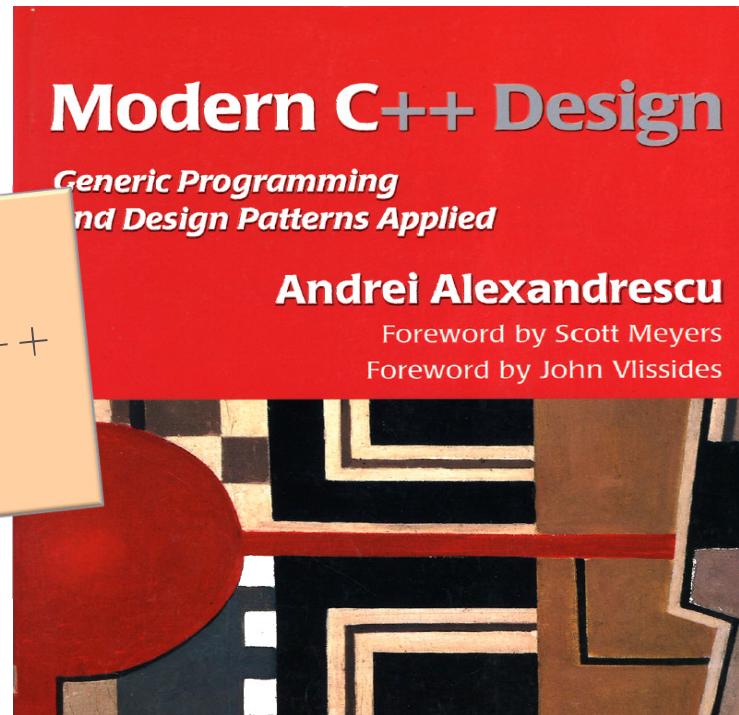
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“Modern C++ Design”

Andrei Alexandrescu

- From 2001 – C++ has evolved since then
- Very focused on templates
 - Policy based class design
 - Allocators
 - Type lists
 - Compile time assertions

- Still a good read
- Influenced our thinking about C++
- But not “Modern C++” anymore





Meeting C++

@meetingcpp

So what is "Modern C++"?

~~13%~~ new standards + boost

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375 votes • Final results

Modern C++ is...

... what we consider best practice

- Use the newer features sensibly
 - E.g. use `auto`, but not *always*
- But also the old
 - E.g. RAII is *still* modern
- Combine to get the best out of the language

Your path through the pitfalls of the ancient



C++ - the good parts

The Safe Guide

O RLY?

Community

The Good Parts

“When I was a young journeyman programmer, I would learn about every feature of the languages I was using, and I would attempt to use all of those features when I wrote. I suppose it was a way of showing off, and I suppose it worked because I was the guy you went to if you wanted to know how to use a particular feature.

Eventually I figured out that some of those features were more trouble than they were worth.[...] Most programming languages contain good and bad parts. I discovered that I could be a better programmer by using only the good parts and avoiding the bad parts. After all, how can you build something good out of bad parts?

It is rarely possible for standard committees to remove imperfections from a language because doing so would cause the breakage of all the bad programs that depend on those bad parts. [...]

But *you* have the power to define your own subset. You can write better programs by relying exclusively on the good parts.”

Douglas Crockford – “JavaScript: The Good Parts”

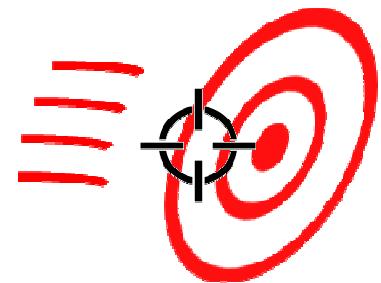
"Within C++ is a smaller, simpler, safer language struggling to get out."

Bjarne Stroustrup

Modern C++ is...

... a moving Target

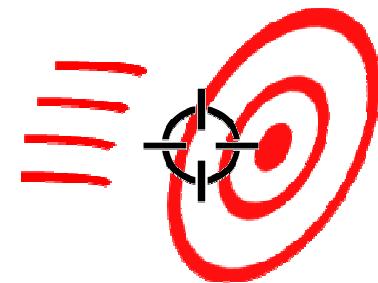
- Continuously new features
 - New standards currently every ~3 years
 - Plus TS



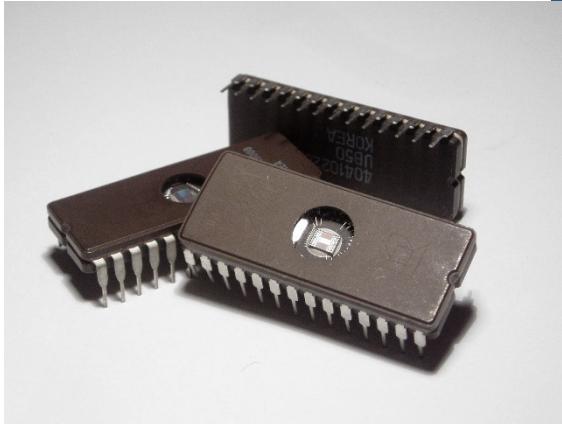
Modern C++ is...

... a moving Target

- Continuously new features
 - New standards currently every ~3 years
 - Plus TS
- But besides that, our *understanding* of the language continually changes
 - E.g. “universal references”
 - E.g. “Almost Always Auto”

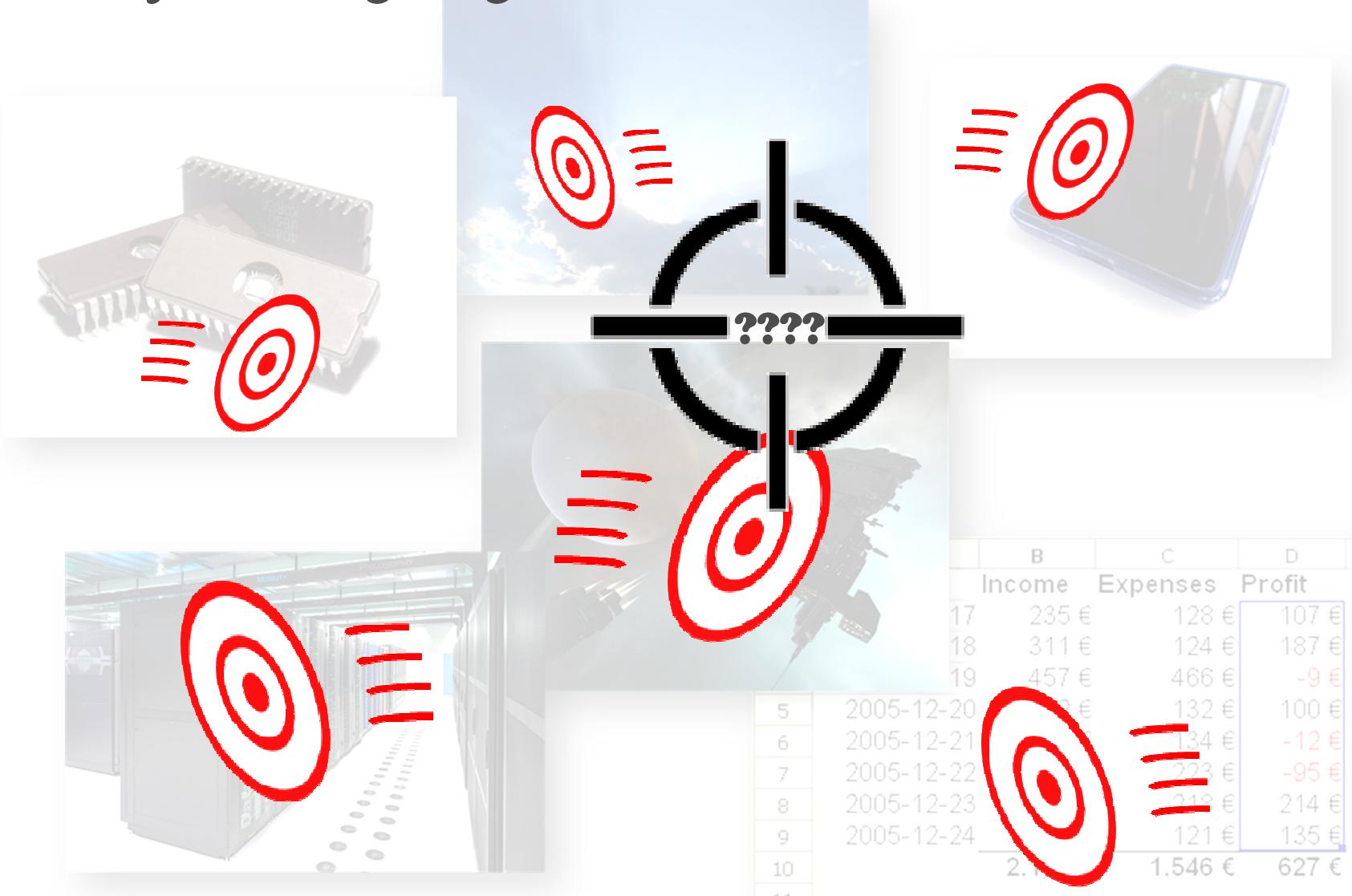


```
Widget w{"myWidget"};  
  
auto w = Widget{"myWidget"};
```



	B	C	D
	Income	Expenses	Profit
17	235 €	128 €	107 €
18	311 €	124 €	187 €
19	457 €	466 €	-9 €
5	2005-12-20	232 €	132 €
6	2005-12-21	122 €	134 €
7	2005-12-22	128 €	223 €
8	2005-12-23	432 €	218 €
9	2005-12-24	256 €	121 €
10		2.173 €	1.546 €
			627 €

Many moving targets...



Many moving targets...

... e.g. sales pitch for RAII

- Usual examples:
 - `unique_ptr` (memory)
 - `lock_guard` (mutexes)
 - `fstream` (files)
- Usual argument: Exception safety



Additional challenge

... for teachers

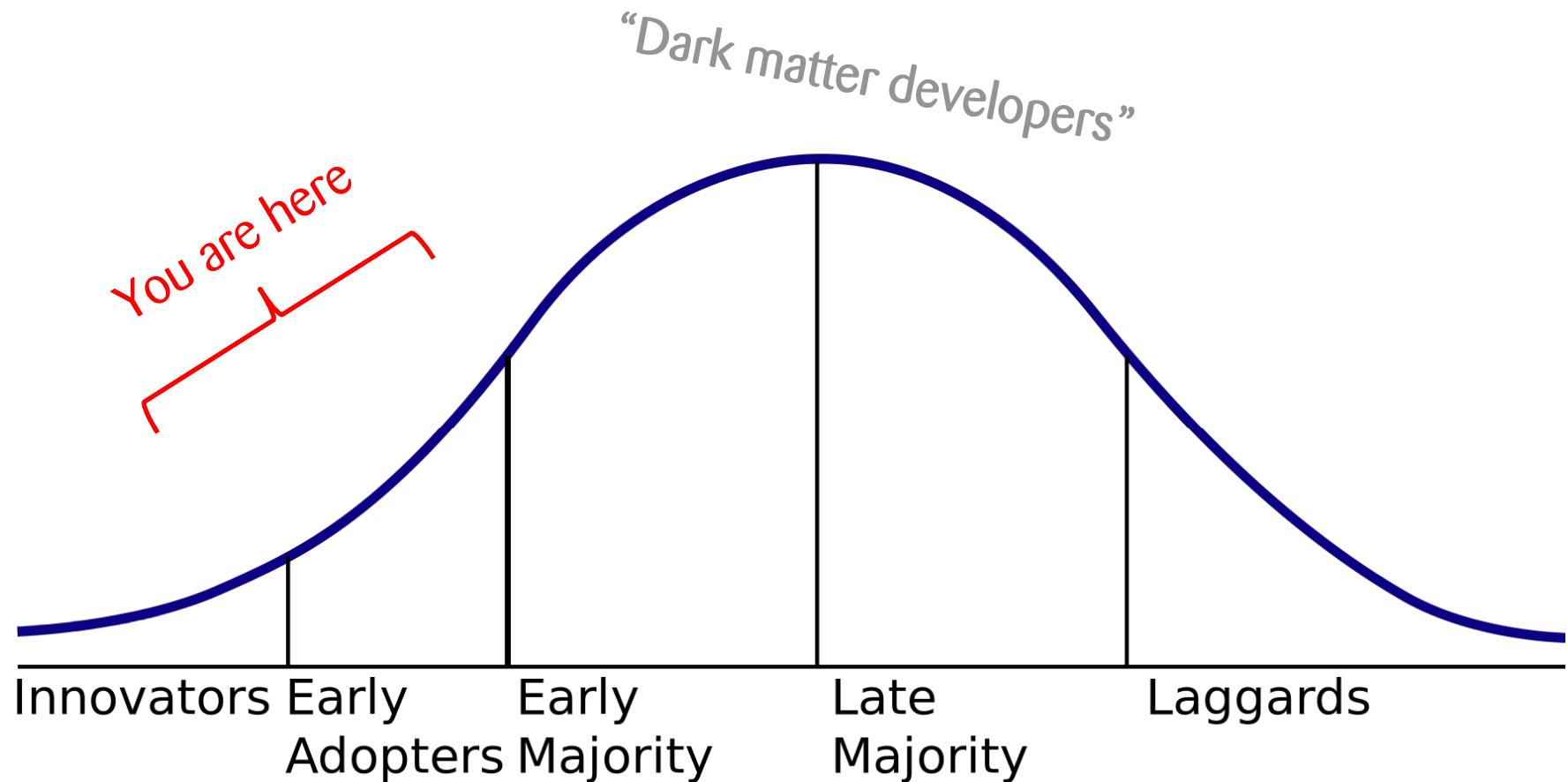
- We have learned modern C++ to be
 - Old C++ (or even C)
 - plus changes
- Modern C++ != layered evolution
- What we see and learn first sticks best

→ Teach straight to the point instead of retelling our personal history

Example: start with `make_unique` & `unique_ptr` instead of `new/delete` → smart pointers

Adoption takes time

Not everyone uses the newest stuff...
... in fact, most probably don't.





Arne Mertz

@arne_mertz

When learning C++, what was your major source of knowledge?



Arne Mertz

@arne_mertz

When learning C++, what was your major source of knowledge?

6% Teacher/Professor

56% Books

31% Online Tutorials & Blogs

7% Other (please specify)

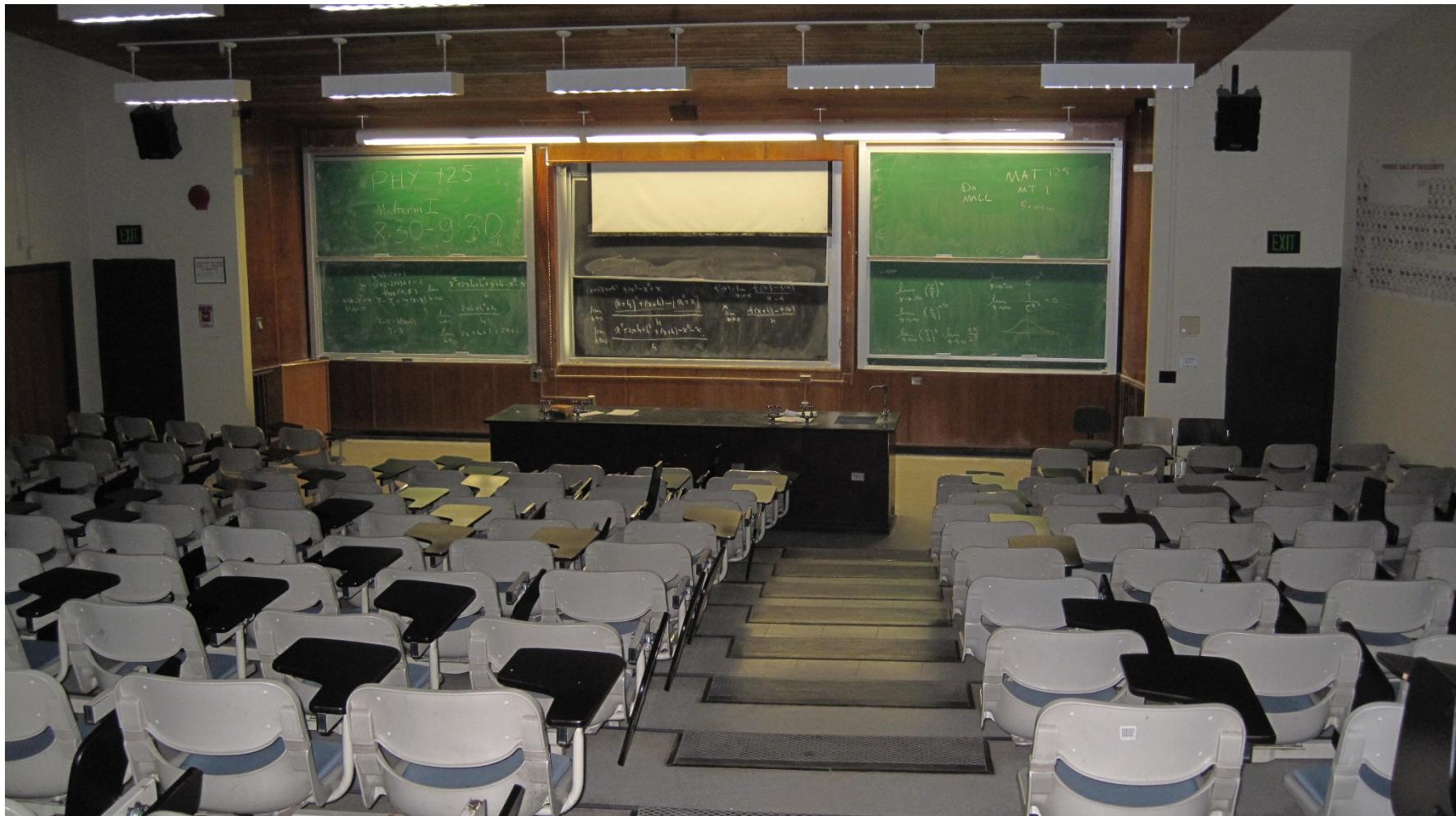
469 votes • Final results

Other:

- + colleagues
- + Reading code
- + Magazines
- + usenet
- + books!

Class room...

... and teachers/professors



Class room...

... and teachers/professors

- Some teachers are enthusiastic and love to teach
 - Others don't but *have* to
 - Prepare class once
 - Repeat for N years
- fresh legacy C++ students

Class room...

Stop using Turbo C++: That is now stupid

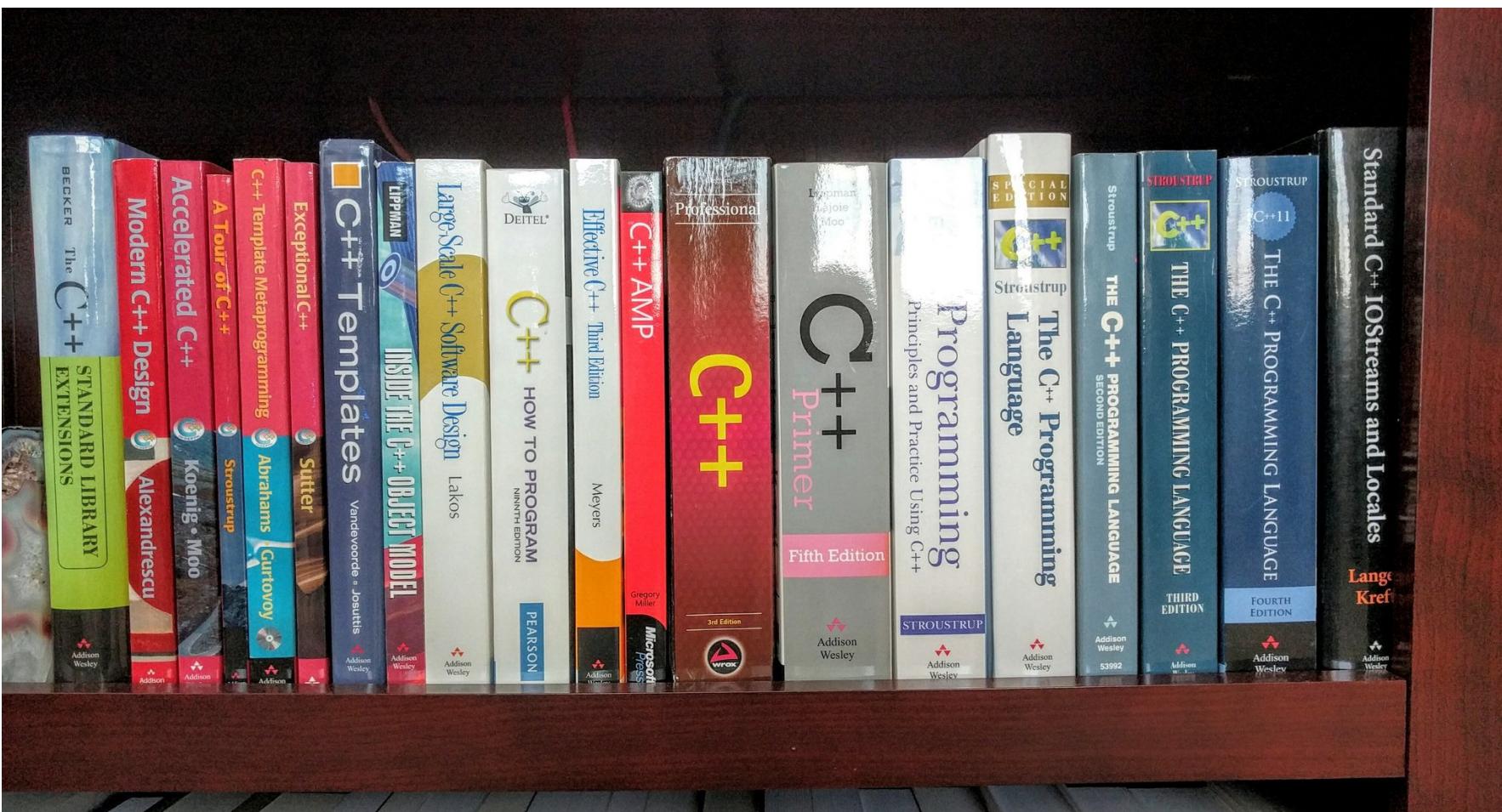
Sep 09, 2015 | by Saurabh Tripathi | in Opinions

Saurabh Tripathi → Arne Mertz • a year ago

Thanks for your comment, I completely agree that Turbo C++ is old and it should not be used. In most of the engineering collages in India, students are forced to use Turbo C++ in classrooms. I think you can understand why the post still makes sense for Indian students.

Reply Share

Books



Books

Pros:

- Consistency, didactic line of thought
- Usually reviewed (but not always)

Cons:

- Last longer than the validity of the content
- Are often promoted to make money – not because they are good
- Errors are hard to fix
- Usually not free of charge (*this does matter!*)

Books

C++ <iostream.h> Error



I am at the absolutely newest level of new when it comes to C++. It may seem like a noob mistake, but I think I'm missing something with my first program, "Hello World!".

0



I'm running from Ubuntu (not sure if this is any different from working with Windows), and I'm using a book called *Teach Yourself C++ in 21 Days*.



The code I'm resembling looks exactly like this:

```
#include <iostream.h>
int main()
{
    cout <<"Hello World!\n";
    return 0;
}
```

I have this exactly in my text editor, but I keep getting greeted by the same error whenever I try to compile it!

first.cpp:2:22: fatal error: iostream.h: No such file or directory compilation terminated.

I'm pretty distressed as this is literally the first step in my coding career! I'm not sure if ubuntu needs to be treated differently than Windows (which is what the book is using as reference).

Help!

asked Jul 13 '13 at 20:16

Blogs & Tutorials

Meeting C++ Blogroll 79
2016-11-11 10:19 by Jens Weller

Blogroll No. 79 - 11. November

- [agilecxx - Templates and binary bloat](#)
- [Aras - Interview questions](#)
- [Arne Mertz - Modern C++ Features – Variadic Templates](#)
- [Bartek's Coding Blog - Variadic Templates and a Factory Function](#)
- [Bits of Bytes - How to contribute to an open source project on Github](#)
- [Bitwise Bytes - How to use databases in your application with SQLite and Qt](#)
- [C++ Island - sizeof_ When The Whole is Greater Than The Sum Of Its Parts](#)
- [C++ Truths - Dependently-typed Curried printf](#)
- [Clion - Clion 2016.3 Release Candidate](#)
- [CPP Rendering - Vulkan Memory Management : How to write your own allocator](#)
- [CPP Rendering - Barriers in Vulkan : They are not that difficult](#)
- [Dimitar Mirchev - C++ tips, 2016 Week 44 \(31-Oct - 6-Nov-2016\)](#)
- [Italian C++ - C++ Day 2016](#)
- [Ivan Cukic - Functional Programming in C++ book, and the promo discount codes](#)
- [Jacko's C++ Blog - Python Style printf for C++ with printpp](#)
- [jemalloc - 4.3.0](#)
- [jemalloc - 4.3.1](#)
- [Josh Habermann - Introducing Bloaty McBloatface: a size profiler for binaries](#)
- [Kenny Kerr - C++/WinRT: Working with Implementations](#)
- [Krister Walfridsson - Inlining — shared libraries are special](#)
- [Krister Walfridsson - "missing" optimizations — constant address comparison](#)
- [kukuruku - Asynchronous Programming Part 2: Teleportation through Portals](#)
- [Marius Bancila - My book on modern C++ programming](#)
- [Meeting C++ - Collaborative Online C++ Compiler?](#)
- [Meeting C++ Blogroll - Meeting C++ Blogroll 78](#)
- [Meeting C++ News - PPQ = Pizza & Pasta and a Quiz!](#)
- [Meeting C++ News - Meeting C++ 2016 is sold out!](#)
- [Modernes C++ - The null pointer constant nullptr](#)
- [Modernes C++ - inline](#)
- [Modernes C++ - Constant expressions with constexpr](#)
- [NVIDIA DevBlog - New Compiler Features in CUDA 8](#)
- [pzemtsov - A bug story: data alignment on x86](#)
- [Qt Blog - Qt on the NVIDIA Jetson TX1 – Device Creation Style](#)
- [Qt Blog - Qt Visual Studio Tools 2.0 Released](#)
- [Qt Blog - Over-the-Air Updates, Part 3: Repository Configuration and Handling](#)
- [Rainer Grimm - Reine Funktionen](#)
- [Rambling Comments - Practical Testing: 34 - Potential reentrant locking deadlock](#)
- [Rambling Comments - C++ Tools - Some thoughts on JetBrains ReSharper C++](#)
- [Rambling Comments - C++ Tools - JetBrains ReSharper C++ is slowly winning me over](#)
- [Rambling Comments - Practical Testing: 36 - Timeout handle wrap](#)
- [Rebecca Fernandez - Object pools, variadic templates and reference forwarding](#)
- [SanSS - Database transaction handling in C++ systems](#)
- [The Old New Thing - How do I programmatically add a folder to my Documents library?](#)
- [videocortex - Terminators](#)
- [Visual Studio Blog - Developing Linux C++ applications with Azure Docker containers](#)
- [Visual Studio Blog - Visual C++ docs: the future is... soon!](#)
- [zverovich.net - Reducing printf call overhead with variadic templates](#)

Blogs & Tutorials

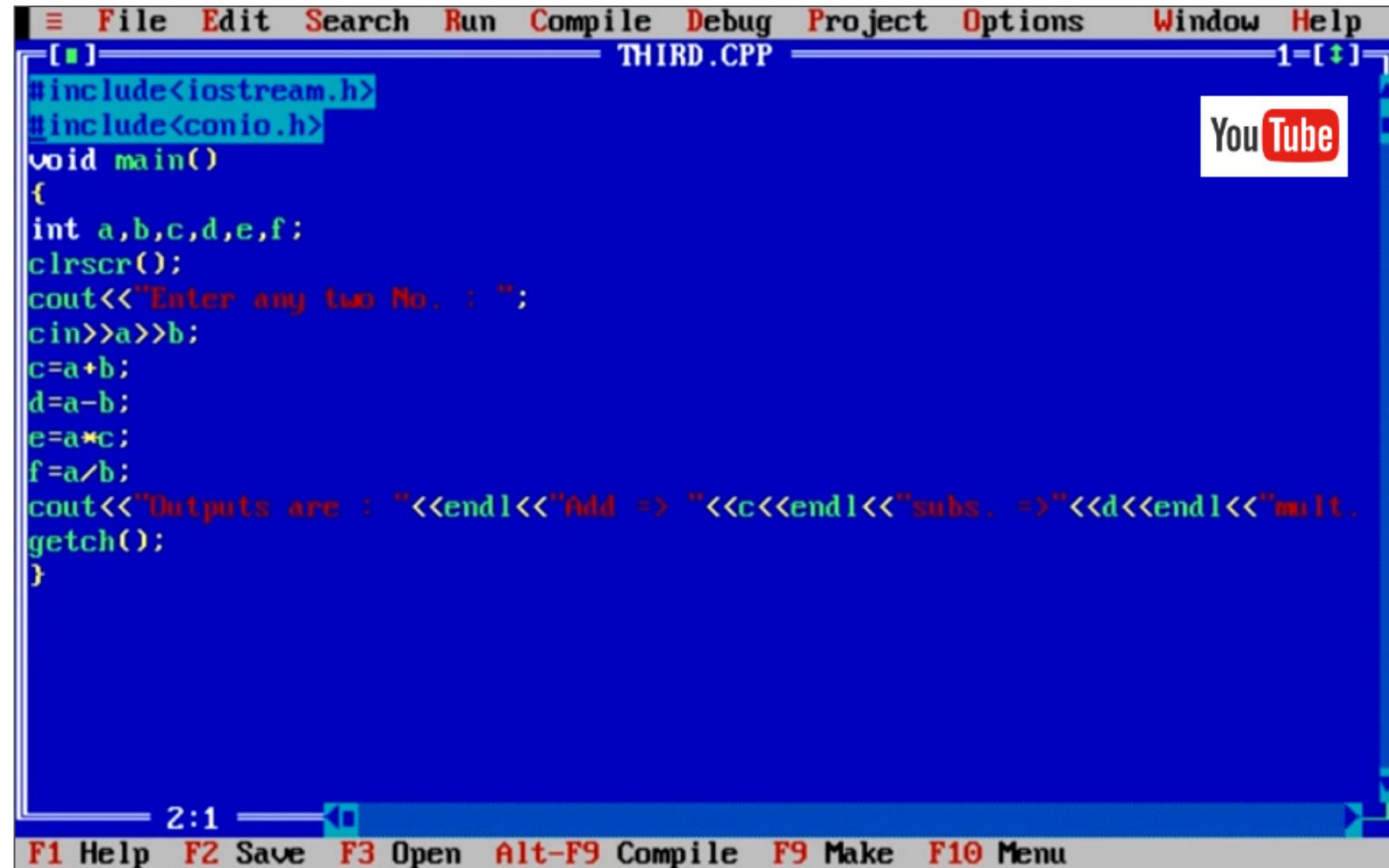
Pros:

- Usually free of charge
- Authors can always fix things or take them offline

Cons:

- But we usually don't
- Hardly any review
- Less coherent bits and pieces

Blogs & Tutorials



The screenshot shows a Microsoft Visual Studio IDE window. The menu bar includes File, Edit, Search, Run, Compile, Debug, Project, Options, Window, and Help. The title bar displays "THIRD.CPP". The code editor contains the following C++ code:

```
#include<iostream.h>
#include<conio.h>
void main()
{
int a,b,c,d,e,f;
clrscr();
cout<<"Enter any two No. : ";
cin>>a>>b;
c=a+b;
d=a-b;
e=a*c;
f=a/b;
cout<<"Outputs are : "<<endl<<"Add => "<<c<<endl<<"subs. =>"<<d<<endl<<"mult.
getch();
}
```

The status bar at the bottom shows "2:1" and various keyboard shortcut keys: F1 Help, F2 Save, F3 Open, Alt-F9 Compile, F9 Make, F10 Menu.

Blogs & Tutorials

```
#include<iostream.h>
#include<conio.h>
#include<string.h>
Void main()
{
    clrscr();
    Char a[20];
    Cout<<"enter string "<<endl;
    Cin>>a;
    Strlwr(a); // strupr(a) for uppercase letter as output
    Cout<< string in lower case letters :"<<a;
    Getch();
}
```

String handling functions in C++

In c++ we have many string handling functions, which are used for comparing ,reversing ,and joining or addition of string and much more. These all string handling functions contained in "string.h" header file. so whenever we have to perform any related operation then we have to include string.h header file in our program.

In this article we are going to learn about following string handling functions.

.Strlen() – used to find the length of string

.Strcat() – used to add two strings.

.Strcpy() – used to copy string

.Strrev() – used to reverse a string

.Strlwr() – used to change letters to lowercase letters



Author:

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Google+

Colleagues & reading Code



Colleagues & reading Code

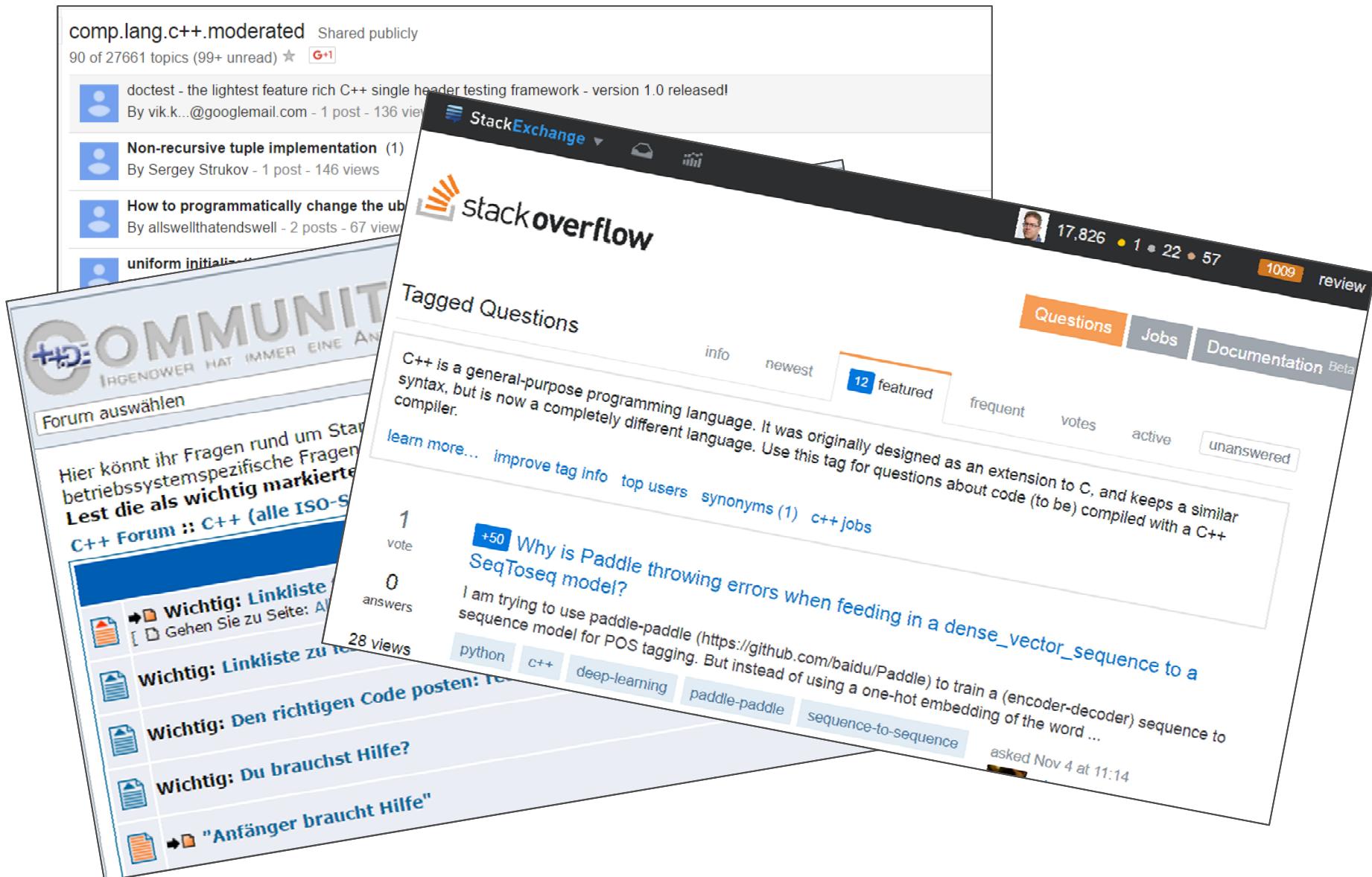
- Code has to be *extremely* well written to serve as a well documented resource for self-learning
- We can get lucky if we have a colleague or read code by someone who knows modern C++

They probably also know the quirks of our niche

- But even then
“knowledge inbreeding” – no fresh ideas
- And if not?

We learn the same outdated stuff the rest of the team is practicing

Forums, Usenet, Stackoverflow



Forums, Usenet, Stackoverflow

Pros:

- Multiple views, i.e. a community

Cons:

- Very specific detailed topics
- Too much noise
- Trolls

More

C++ Core Guidelines

Best practice guidelines accompanied by static analysis rules.

- Static analyzers can find a lot of code smells
- Core guidelines have rationale and alternatives for unsafe and outdated idioms
- <https://github.com/isocpp/CppCoreGuidelines>

What do we need for better learning resources?

And *teaching* resources, of course.

- Authority – to attract more students

When someone asks for a resource, there should be one or two answers, not tens or hundreds

- Flexibility or even volatility
 - To avoid outdated resources
 - To adapt resources to different needs (niches)
- A community
 - Healthy discussion about modern C++
 - More than a single opinion

What we have

<https://isocpp.org/>

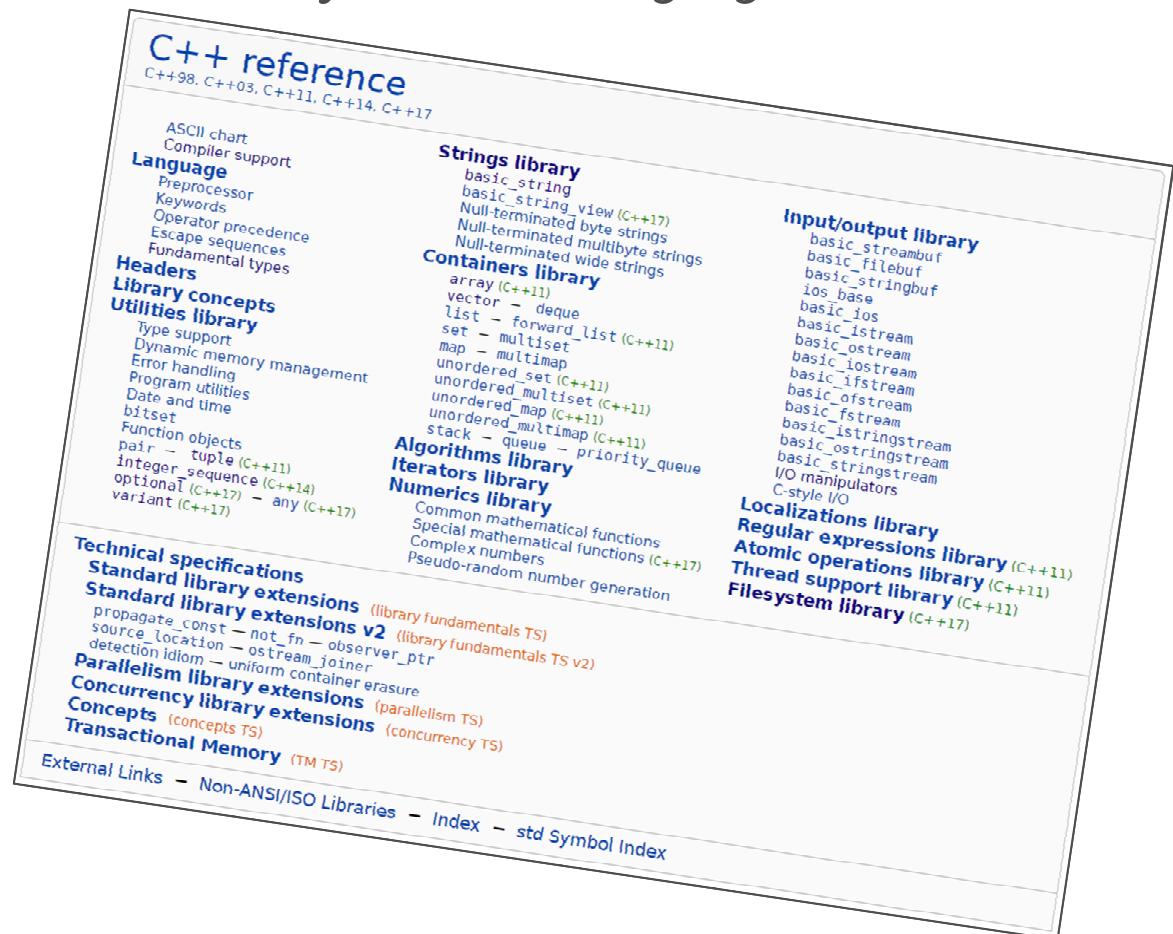
- Hub for C++-related things
- Forum
- Blog
 - Blogs & Books
 - Videos
 - Events & Training
- Standardization Info
 - Status, Notes,...
- C++-FAQ



What we have

cppreference.com

- Online reference for standard library and core language features
 - Wiki format
 - Up to date
- Still only a reference
 - Only few basics
 - No reading order
- Executable code



What we have

StackOverflow Documentation

- A place for code examples and documentation
 - Like a collection of community-edited blog articles
- Still in beta
 - Not much content yet
- No apparent order

<https://stackoverflow.com/documentation/c%2b%2b/>

What I'd like to have...

... just fantasizing...

A Wiki-Blog similar to SO Documentation

- Where people can compile “books” by aggregating single pages
Different books for different needs
- Well-moderated discussions

Questions? Ideas?

Let's talk!

Thank you!



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Simplify C++!
ARNE-MERTZ.DE

cpplang.slack.com
cpplang.diegostamigni.com