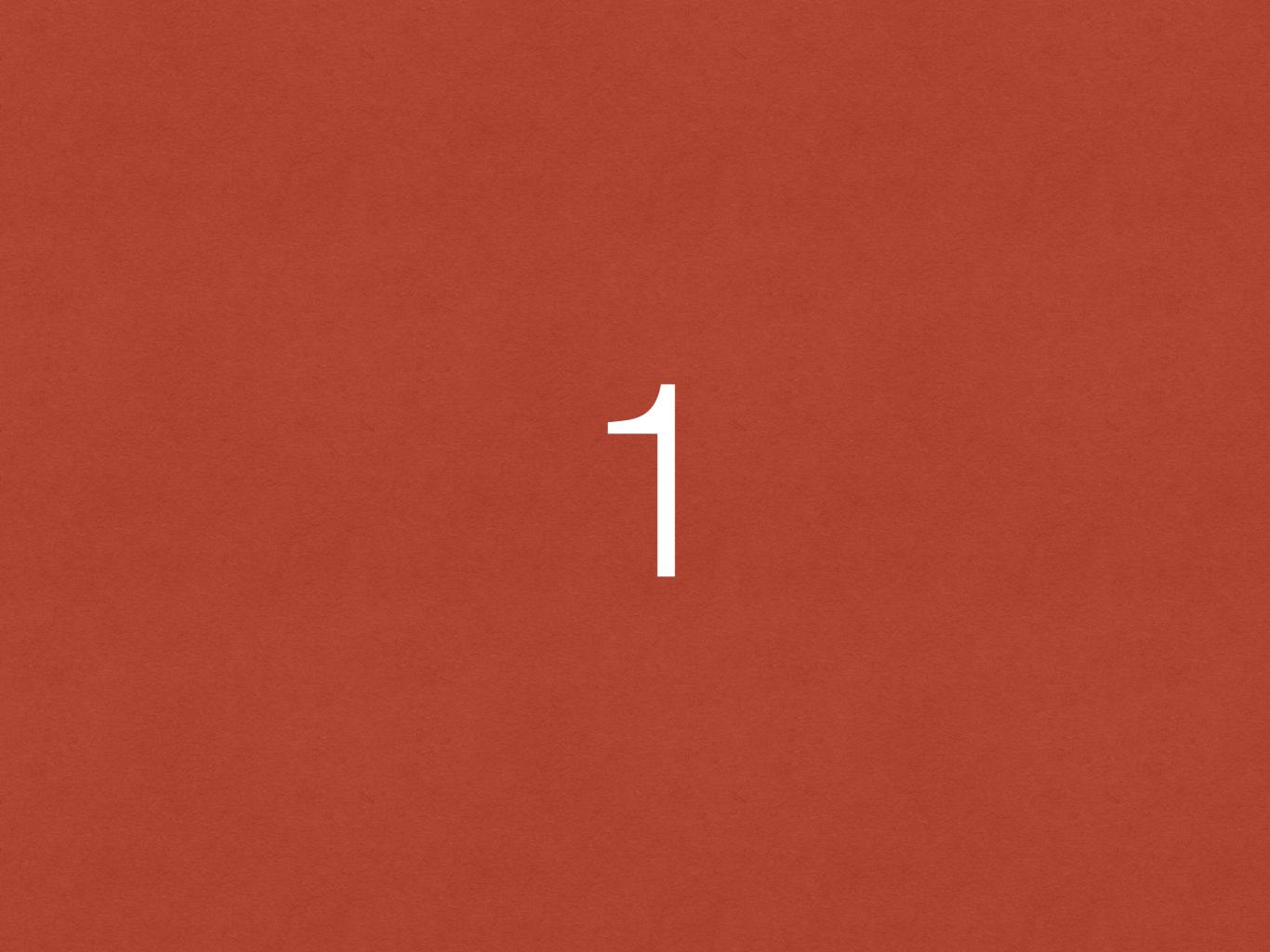# C++ Std Meeting Urbana, 2014

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Group Meeting 2014-12-01

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Content

- Meeting stats

- Context, C++ 14 Status

- CERN involvement

- Big chunks: transactional memory, networking, executors, vectorization, concepts lite, reflection, modules, coroutines, contracts

- Side-effects, Conclusion

Meeting Stats

- >100 participants (7 nations); >120 papers

- Parallelism (par_vec algos etc), Library Fundamentals TS send to second = final ballot

- Transactional Memory: first ballot

Intense Schedule

- 8:30 - 12:xx: session

- lunch break to discuss C++

- 13:30-17:yy: session

- dinner break to discuss C++

- 19:00-…: session

- …-early (agreement: hotel bars help)

Tracks

- Spent all my time in Evolution (future language features)

    - except vectorization, variant

- Evening sessions: reflection, modules, pattern matching, co-routines, ranges

Context

- C++14 is "pending publication by Geneva" - still.

- First post-C++14 meeting

- "Opened" C++17 with first changes

- Two proposals from CERN: runtime sized objects, variant

- Held a pre-meeting seminar at CERN (about 30 participants) and at Fermilab (20 participants)

Details, Details…

Runtime Sized Objects

- By Laurent Deniau, BE (and me)

- struct S { int Size; MyClass Arr[Size]; };

- part of dynarray, VLA,… saga

- Result: "further work encouraged"

  - BUT too many half-baked / limited proposals

  - next effort: take stock, discuss, propose

std::variant

- variant<int, float, MyClass> holds either an int, float or a MyClass object

- They want more details for the design discussion, especially "can a variant be empty?"

- Got Nevin Liber (experienced committee member) as co-author

  - I will make progress in Kansas, Nevin on Hawaii

Transactional Memory TS

- E.g. annotate functions as transaction safe

- Now sent to ballot

- I will forward this to the group for comments once available

Executors

- Schedulers

- Conflicting proposals now merging

- Hope for TS for Kansas

Vectorization

- Three conflicting (?) proposals:

    1. SIMD for

    2. vectorized algorithms

    3. SIMD types

- Merge of 1, 2: discrepancies in content now resolved

- 3 (Vc's Matthias Kretz): independent green light, now waiting for update with ABI clarifications

Coroutines

- Threading interface

- Voted for pursuing both fibers (thread scheduling) and coroutines (small work unit without dedicated stack, N4134). Latter is a revolution.

```cpp
std::future<void> tcp_reader(int total) {
  char buf[64 * 1024];
  auto conn = await TcpConnect("127.0.0.1", 1337);
  do {
    auto bytesRead = await conn.read(buf);
    total -= bytesRead;
  } while (total > 0);
}
int main() { tcp_reader(1000 * 1000 * 1000).get(); }
```

Network TS

- Restart based on ASIO

- Possible interaction with coroutines…

Contracts

- Specify precondition, postcondition; for correctness + speed (optimizations)

- Several proposals on the table; people now agree on what we want:

  - language feature

  - part of function declaration

  - compilers must be able to turn verification off

Concepts Lite

- Instead of template instantiation errors, specify concepts:

```
vector(const T& v) requires Copyable<T>();
```

```
template<Floating_point T> class complex;
// OR:
template<typename T> requires Floating_point<T>()
  class complex;
```

- Still wording reviews :-(Hopefully on its way to a TS by Kansas!

Reflection

- We agree on what we want - but have two ways of embedding it in C++!

  - std::reflect<T>: N4027, A. Tomazos, C. Kaeser

  - constexpr(T): N3996, Matúš Chochlík

    - watch for completely unrelated :-) proposal

- I will support Matúš (Slovak Republic) who cannot participate at meetings

Modules

- Modular precompiled headers replacing #include

- Proposal by Microsoft, discussed with clang gang

  - Only disagreement: should preprocessor macros leak out of modules? (clang: yes, MS: no)

- Performance reports from Sony (see Vassil's presentation), 2x build (!) speedup

- I hope this converges soon; everybody wants it…

Home Stretch!

Fallout

- Invited Bjarne to ROOT Users Workshop, to be announced and confirmed

- Got Universidad Carlos III de Madrid and Swiss National Supercomputing Center interested to send Technical Students etc; will ask James Purvins

Next

- Some in-between meetings to catch up with high work load (library working group etc)

- May 4-9, 2015: Kansas (going)

- Oct 19-24, 2015: Kona, Hawaii (not going)

- Should send someone to <u>CppCon</u> (that's a link)

  - the center for C++ craziness

Conclusion

- Exhausting, intense, productive.

- People know me :-)

- variant: good way to show that we are serious

- reflection: experience, proposal in need

- Result of participation: not just ISO standard, but increased CERN visibility (I should blog again...) and attractiveness; students?