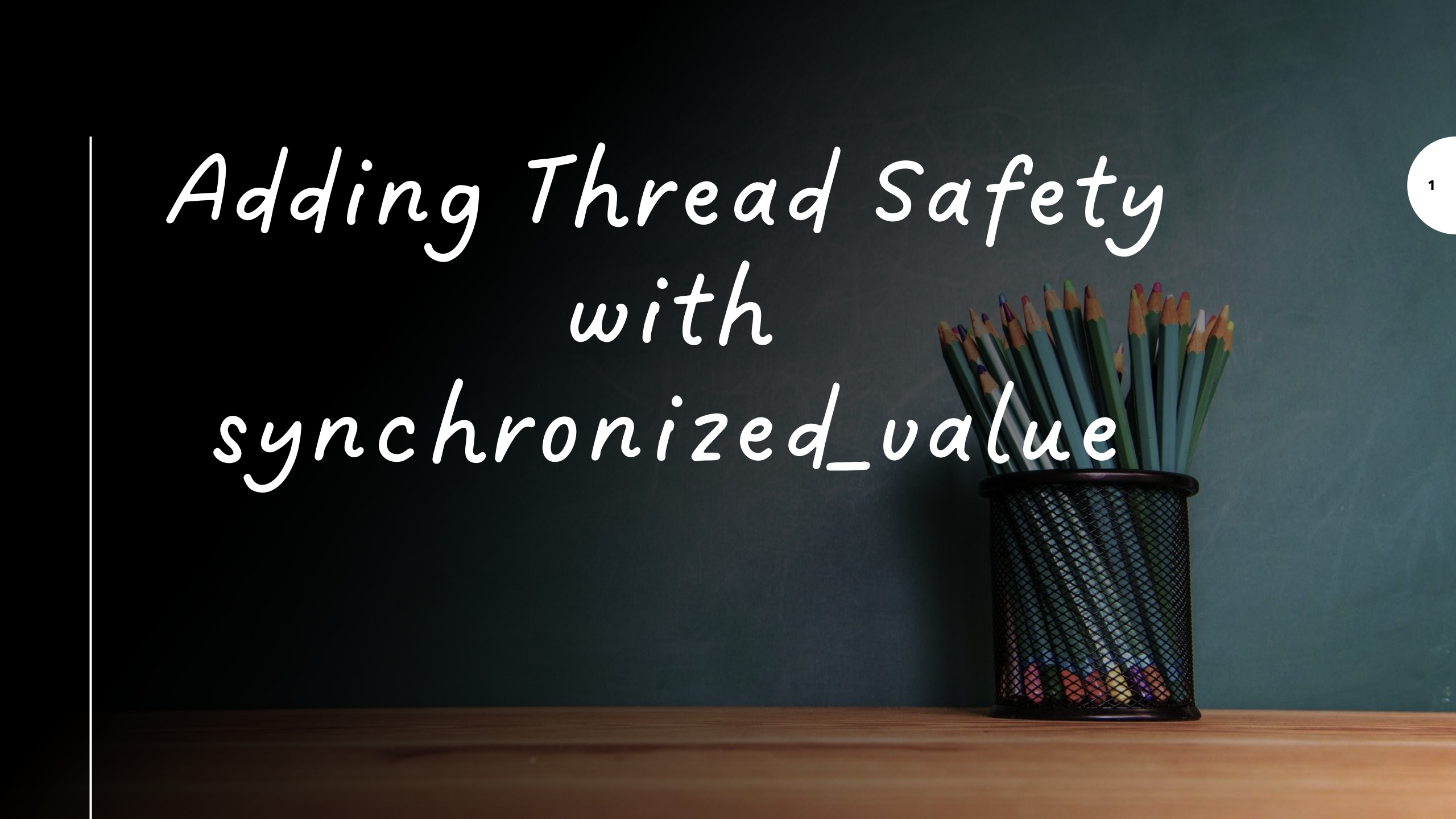
Adding Thread Safety with synchronized_value



Proposed by Anthony Williams in 2014

Proposals: N4033, P0290r4

```
class legacy_class
{
    std::map<int, shared_data> map_;
public:
    auto function_a() {
        // ... 100 lines
    }
    auto function_b() {
        // ... 50 lines
    }
    auto function_c() { … }
    auto function_d() { … }
    auto function_e() { … }
};
```

Solution 1: std::mutex

```
class legacy_class1
{
    std::mutex mutex_;
    std::map<int, shared_data> map_;
public:
    auto function_a() {
        std::unique_lock lock{mutex_};
        // ... 100 lines
    }
    auto function_b() { … }
    auto function_c() { … }
    auto function_d() { … }
    auto function_e() { … }
};
```

```
class legacy_class1
{
    std::mutex mutex_;
    std::map<int, shared_data> map_;
public:
    auto function_a() {
        std::unique_lock lock{mutex_};
        // ... 100 lines
    }
    auto function_b() {
    auto function_c() {
    auto function_d() {
    auto function_e() {
};
```

Comment

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Solution 2: Wrapping the Data

```
template <typename Key, typename Value>
class synchronized_map
{
    std::mutex mutex_;
    std::map<Key, Value> map_;
public:
    auto& operator[](Key k) {
        std::unique_lock lock{mutex_};
        return map_[k];
    }
    // ...
};
```

```
template <typename Key, typename Value>
class synchronized_map
{
    std::mutex mutex_;
    std::map<Key, Value> map_;
public:
    auto& operator[](Key k) {
        std::unique_lock lock{mutex_};
        return map_[k];
    }
    // Delegate all methods:
    // at()
    // begin()
    // end()
    // cbegin()
    // cend()
    // ...
};
```

Solution 3: synchronized_value

```
class legacy_class3
{
    synchronized_value<std::map<int, shared_data>> map_;
public:
    auto function_a() { … }
    auto function_b() { … }
    auto function_c() { … }
    auto function_d() { … }
    auto function_e() { … }
};
```

```
class legacy_class3
{
    synchronized_value<std::map<int, shared_data>> map_;
public:
    auto function_a() {
        // ... 30 lines
        auto value0 = map_->at(13);
        auto value1 = map_->at(37);
        // ...
    }
    // ...
};
```

```
class legacy_class3
{
    synchronized_value<std::map<int, shared_data>> map_;
public:
    auto function_a() {
        // ... 30 lines
        {
            update_guard<std::map<int, shared_data>> guard{map_};
            auto value0 = guard->at(13);
            auto value1 = guard->at(37);
        }
        // ...
    }
    // ...
};
```

https://github.com/jrgfogh/synchronized_value