Futuristic Error Handling

Error handling in C++ today and tomorrow

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Introduction

Why am I here?

Why should we bother with error handling?

Recommendable error handling mechanism

Which error mechanism would you choose?

There exist two common strategies for error handling:

- error codes?
- exceptions?

Error codes nowadays

The error codes.

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- Machine friendly.
- Super fast.
- Used till today.

Error code example

```
int sqlite3_open( const char *filename, sqlite3 **ppDb );
```

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```

```
int open_status = sqlite3_open(/* ... */ );
if(open_status == SQLITE_OK){
  // make use of opened database
} else if( open_status == SQLITE_CANTOPEN_ISDIR ) {
  // handle the error
}
```

Handle the error

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- `std::terminate()`
- take the error callback
- propagate the error to the caller

Error codes - propagation

propagation

```
void foo_bar(int& errc /*...*/){
  errc = foo();
  // ...
  errc = bar();
  // ...
}
```

error translation

```
void foo_bar(foo_bar_errc errc&){
  foo_errc ferrc = foo();
  errc = translate_foo(ferrc);
  // ...
  bar_errc berrc = bar();
  errc = translate_foo(berrc);
}
```

C-style error codes summary

So we can see serious disadvantages (except for obvious advantages):

- success path same as error path

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C-style error codes summary

So we can see serious disadvantages (except for obvious advantages):

- success path same as error path
- boiler plate code
- cluttering code with translations

Error codes - modern approach

standard library support - what do we need?

- A way to define new error codes
- A way to distinguish domain of the error codes
- And to fix as many C-style issues as possible

standard library support - what we get?

We get three new major types:

- std::error_code
- std::error_category
- std::error_condition

std::error_code in action

```
std::error_code errcode;
is_regular_file("non_existent_directory", errcode);

std::cout << errcode << std::endl;
std::cout << errcode.value() << std::endl;
std::cout << errcode.message() << std::endl;
std::cout << errcode.category().name() << std::endl;
```

---

output

```
$ generic:2
$ 2
$ No such file or directory
$ generic
```

Acting upon error

```
std::error_code errcode;
is_regular_file("non_existent_file", errcode);

if(errcode == errc::no_such_file_or_directory){
  // creating a file
}
```

Let's define our own error code

Steps to create own error code:

- define custom enum with error codes

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- create enum to error code factory function
- (optional) define custom error condition
  - define error condition enum

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- define custom enum with error codes
- inform, that the enum is an error code
- create custom error category (or use existing one)
- create enum to error code factory function
- (optional) define custom error condition
  - define error condition enum
  - inform the world about new error condition enum

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Steps to create own error code:

- define custom enum with error codes
- inform, that the enum is an error code
- create custom error category (or use existing one)
- create enum to error code factory function
- (optional) define custom error condition
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  - inform the world about new error condition enum
  - make conversion function from new error code to error condition

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Steps to create own error code:

- define custom enum with error codes
- inform, that the enum is an error code
- create custom error category (or use existing one)
- create enum to error code factory function
- (optional) define custom error condition
  - define error condition enum
  - inform the world about new error condition enum
  - make conversion function from new error code to error condition
- enjoy!

Error codes - defining custom error codes

Step 1 - define custom enum with error codes

Step 2 - inform the world about new error code type

Step 3 - custom error category

Step 4 - factory function

Step 5 - custom error condition

Step 6 - Enjoy

More complex example

Error codes - summary

Exceptions to the rescue (?)