Post-mortem Debugging with Promises for Node.js

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What is a Promise?

- A Promise is placeholder for a future value.
- Alternative JavaScript design pattern to callbacks.
- Organizes callbacks into discrete steps.
- Helps manage execution order through composition.
- Errors are handled outside primary logic.
- No need for boilerplate checks in every callback.
- Easier to maintain or modify later on.
- Curtails “callback hell”.
- Exists in three states: *pending, resolved, rejected.*

- Callback:

```
function isUserTooYoung(id, callback) {
    openDatabase(function(db) {
        getCollection(db, 'users', function(col) {
            find(col, {'id': id},function(result) {
                result.filter(function(user) {
                    callback(user.age < cutoffAge)
                })
            })
        })
    })
}
```

- Promise:

```
function isUserTooYoung(id) {
    return openDatabase()
        .then(getCollection)
        .then(find.bind(null, {'id': id}))
        .then(function(user) {
            return user.age < cutoffAge;
        });
}
```

Research

What are unhandled rejections?

- Forgetting a catch handler in a Promise chain.
- Throwing an error inside a Promise.
- Calling a function that doesn’t exist.

The problem:

- Promises are rejected silently, code might continue to run.
- A function passed to a promise executed on the *next tick.*
- Unhandled rejections can show up at a different point in time.
- Core dumps and other diagnostics may not be meaningful because the heap structure could have changed.

Solutions being explored:

- Forking when a Promise moves to a rejected state.
  - Expensive and perhaps unnecessary.
  - Implementation of forking and taking a core dump not always accurate.
- Capturing and storing stack traces and rejection data.
- Double-run approach where rejection data is tracked and evaluated in real time.
- Using catch predictions in V8.
  - How long has a rejection been floating around?

Goals:

- Create better tools for post-mortem debugging and diagnostics.
- Evaluate the overhead and benefits of different solutions.