

Try-with-Resources vs. Try-Finally

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Programming Language Tools

Each member used their own PLTs but the most commonly used tools were:

- Java Eclipse
- Python IDLE
- Visual Studio Code
- Octave/Matlab
- Cygwin64 Terminal
- MySQL Workbench



Architecture

- Java server: Uses the abstract syntax tree to analyze all files in the provided directory for their use of Java try statements
 - TryVisitor class: hasResources, hasFinally
- Client: Sends requests to the Java server, stores the results of the try statement analysis in the database
- Database: Has Try table, containing revisions data and boolean values hasResources and hasFinally



Try-with-resources: Pros and Cons

- Pros:

- Reduces the number of lines of code
- Removes the need of the finally block
- Enables the program to open many resources at once
- Closes the resources in reverse order to avoid any dependency errors.

- Cons:

- Adding multiple resource declarations in the try-with-resources statement can cause ugly, hard to read code
- Once a resource is declared in the try-with-resources statement then it is final, you're unable to re-assign or modify the resource



Finally vs. Try-with

```
class Main{
    public static void main(String[] args){
        try {
            // open a file
            // do stuff with file
        } catch (exception) {
            // print exception
        } finally {
            // close the file
        }
    }
}
```

```
class Main{
    public static void main(String[] args){
        try(/* open a file */){
            // do stuff with file
        } catch (exception){
            //print exception
        }
    }
}
```



Research Questions

1. Is try-with-resources widely used?

- Try-with-resources was introduced in Java 1.7 in July 2011.
- It is considered “syntactic sugar”, but it can also improve code quality by ensuring that programmers do not forget to close resources.



Research Questions

2. Has try-with-resources helped remove the need for a finally block?
 - Prior to try-with-resources, all resources opened in a try block had to be closed in a finally block.
 - If programmers are migrating toward using the cleaner and more effective try-with-resources structure, then they should have little to no need for finally blocks.



Implementation

- We modified the existing framework to analyze try statements.
- TryStatement nodes (extension of the ASTNode class) contain a try statement's resources and its catch and finally blocks as attributes.
- For each try statement in the code, we recorded whether it had resources or a finally block

Try statement AST node type.

TryStatement:

```
try [ ( Resources ) ]  
    Block  
    [ { CatchClause } ]  
    [ finally Block ]
```

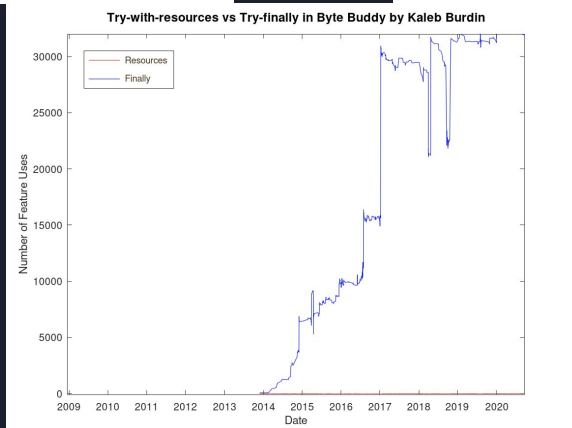
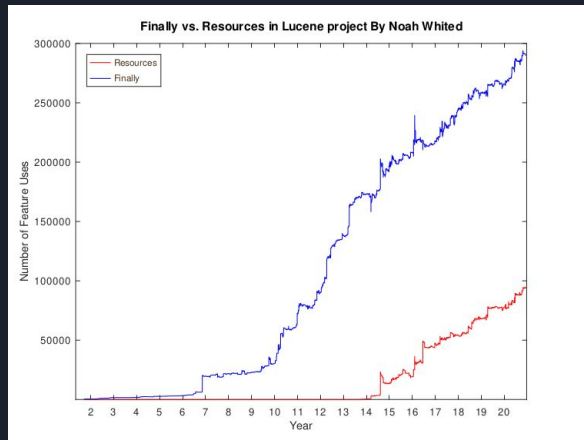
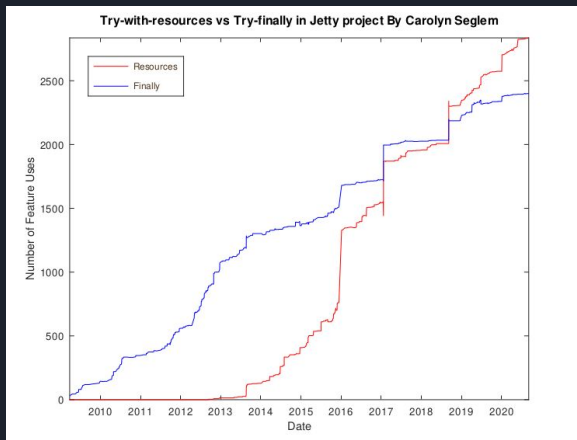



Implementation

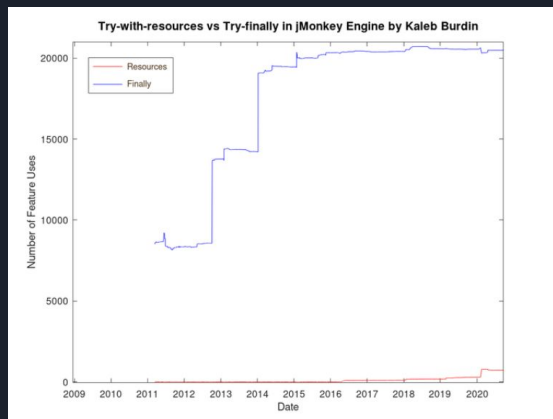
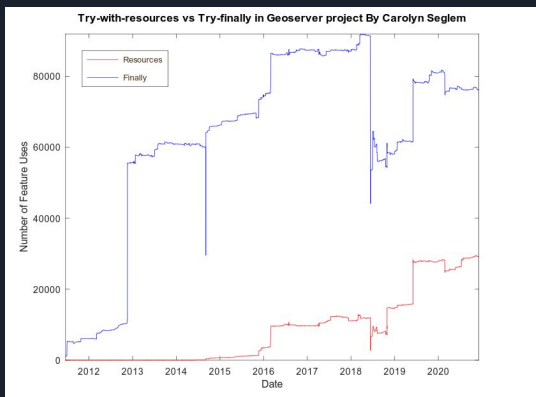
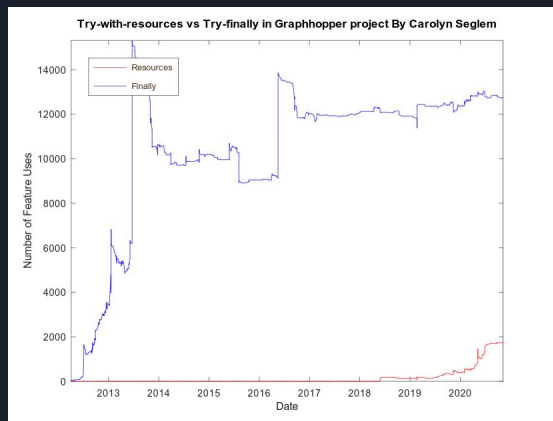
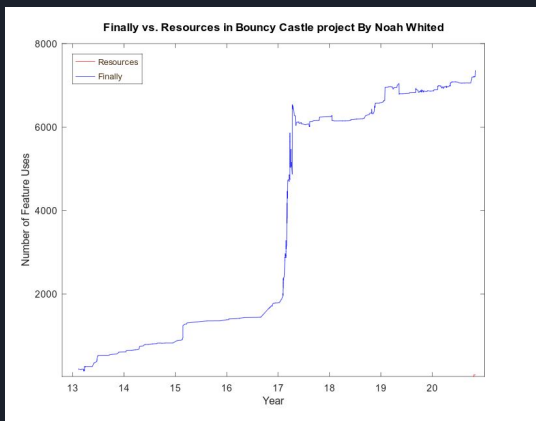
Project Name	Start Date	End Date	LOC	Try-with-resources Expressions
Geoserver	April, 2001	December, 2020	1,568,767	9,778
Graphhopper	April, 2012	November, 2020	123,823	564
Jetty	August, 1998	July, 2019	1,396,226	87,152
Lucene	September, 2001	December, 2020	726,777	93,762
Bouncy Castle	February, 2013	November, 2020	1,113,102	60
jMonkey Engine	March, 2011	December 2020	822,149	720
Byte Buddy	November, 2013	November, 2020	162,635	0

Open source projects used for our analysis

Analysis



Analysis





Results

- The results from our analysis leads us to believe that try-with-resources does in-fact reduce the total lines of code. However it wasn't taken up by developers like we expected.
- Finally blocks are still being used just as often if not more often than try-with-resources in most software.



Results

- Even after developers began to increase their use of try-with-resources structures, they were extremely reluctant to convert previously existing try-finally structures into try-with-resources.
- For example, in Jetty, we only detected 34 instances where people replaced finally blocks with try-with-resources.
- In the Graphhopper project, no finally blocks were replaced with try-with-resources.



Conclusion

- Research Question 1: Is try-with-resources widely used?
 - Only a few developers in each project were responsible for all uses of try-with-resources.
- Research Question 2: Has try-with-resources helped remove the need for a finally block?
 - In all but one of our projects, we found that try-with-resources was used far less than try-finally structures.