

A beginner-friendly environment for exploring error messages in the Clojure programming language.

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- 4 Current State of the Project and Future Work

# Clojure Language and Syntax

What is Clojure? - Clojure language and Syntax

- Clojure is a part of the lisp language family
- Syntax
  - prefix notation (operators before operands).
  - expressions are surrounded by parentheses.

Example: `(/ 9 3)` denotes 9 divided by 3

# Clojure Language and Syntax

- Clojure runs on the Java Virtual Machine (JVM)
  - executed code compiles to JVM bytecode
- clojure code → clojure compiler → JVM bytecode → executed on JVM

# Clojure Language and Syntax

## Clojure's REPL

- interactive environment for code evaluation
- Read → Evaluate → Print → Loop `Tristan: repl`  
`example image`

# Clojure's Error Messages

## Clojure Exceptions

- an event or error that disrupts the normal flow of a program's execution
- Clojure syntax errors will also result in an exception

## Error Messages

- generate when an exception occurs
- provide error type and location

# Clojure's Error Messages

## Anatomy of a Clojure Error Message

```
=> (/ 9 0)
```

```
Execution error (ArithmeticException) at user/eval1  
(REPL:1).
```

Divide by zero

- `ArithmeticException`: The type of error that occurred.
- `user/eval1 (REPL:1)`: The location where the error happened (in this case, REPL, line 1).
- `Divide by zero`: The description of the error's cause.

# Clojure's Error Messages

## Exception Example

```
#error {  
:cause "Divide by zero"  
:via  
[:type java.lang.ArithmeticException  
:message "Divide by zero"  
:at [clojure.lang.Numbers divide "Numbers.java"  
190]}]  
:trace  
[[clojure.lang.Numbers divide "Numbers.java" 190]  
... omitting 18 lines...  
[clojure.main main "main.java" 40]]
```

Tristan: image instead? or maybe not add this



# Jaydon's section

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## Sending Data to Morse

- The Clojure REPL does not provide the proper hooks to effectively manipulate error message data.
- To get around this, we need to initialize Babel within a sub-REPL of the parent REPL session.
- Creating a sub-REPL allows us to introduce hooks that let us add preprocessing steps.

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# Sub-REPL hooks

# Current State of the Project

Elena: Mention older things that we have accomplished

- Most of the work this year was spent structuring things for integration with Morse viewers.
- The introduction of the error labeling Elena: with labels like .... and prototyping this was pivotal in enabling data formatting.
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# Future Work

The following are areas of active development:

- Expand data labeling to all Babel error messages.
- Add hover text for specific terms to add definitions and supplementary information to the presented error message.
- Refining the end user work flow between working code and erroring code.

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- Once we have greater feature coverage in Babel, we plan to run a usability study about the interactive tools we have developed.
- We are going to use the results of letting users explore our tools while learning Clojure in order to guide further design.
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# Discussion

Questions?