Functional Programming in Scala

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Habla Computing

What Is Functional Programming?

- Functional programming is programming with pure functions
- A pure function is just a mapping from input values to output values, that does nothing else
- A pure function doesn’t have side effects

Goals

- Know the design patterns that allow us to purify side-effectful programs
- Understand the reasoning behind functional structures
- Be able to build these patterns from scratch
- Use trending functional libraries that implements these patterns for us

Outline

- Purifying process walkthrough
- Sugaring process walkthrough
- Bonus track: Bundle up your library
- Functional libraries (Scalaz/Cats)
- Conclusions

The Functional Way: Interpreter Pattern

- Programs
  - Just pure immutable values
  - Describe our business logic
  - WHAT
- Interpreters
  - Give meaning to our programs
  - Execute effects
  - Multiple interpreters for same program
  - HOW

Purifying Process Walkthrough

- **Step 1: Ad Hoc programs**
- Step 2: Parameterize your programs
- Step 3: Sequence programs
- Step 4: Sequence context-dependent programs
- Step 5: Add pure computations

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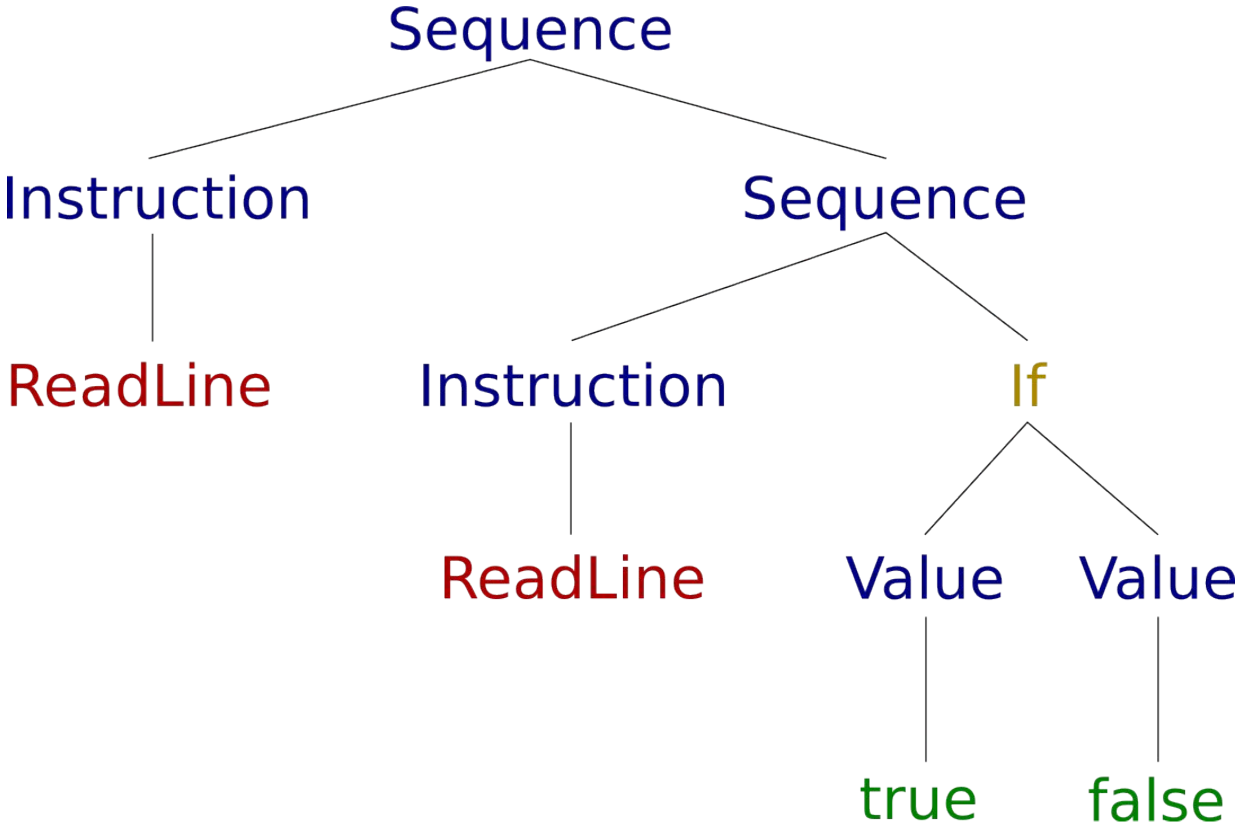
Interpreting a Program



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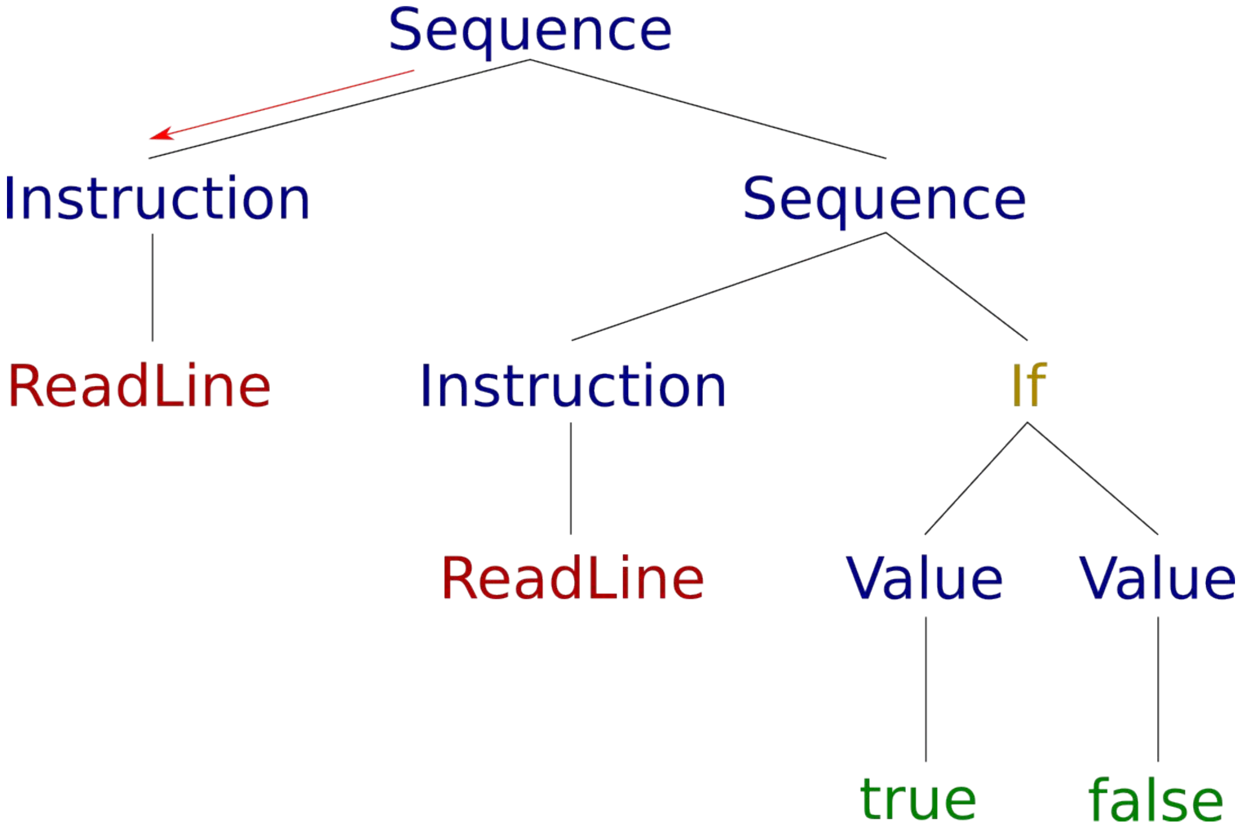

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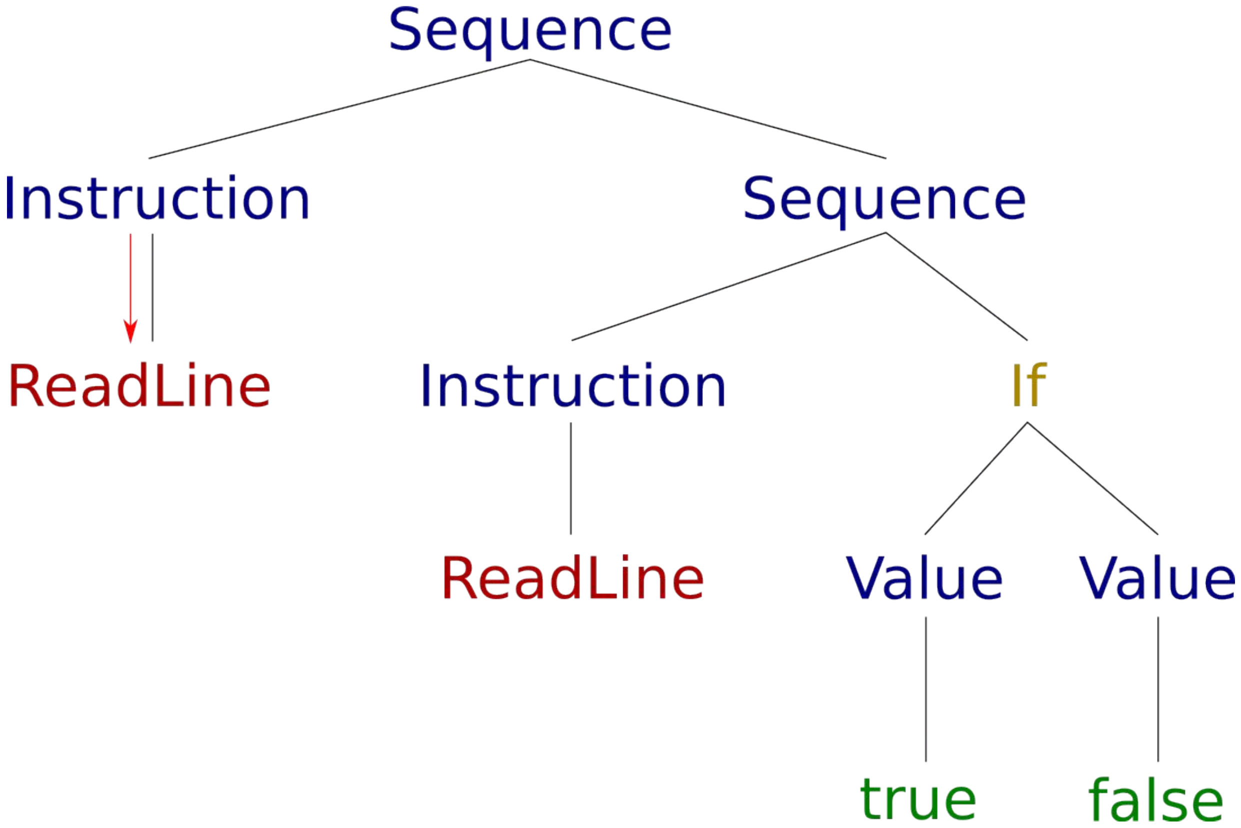

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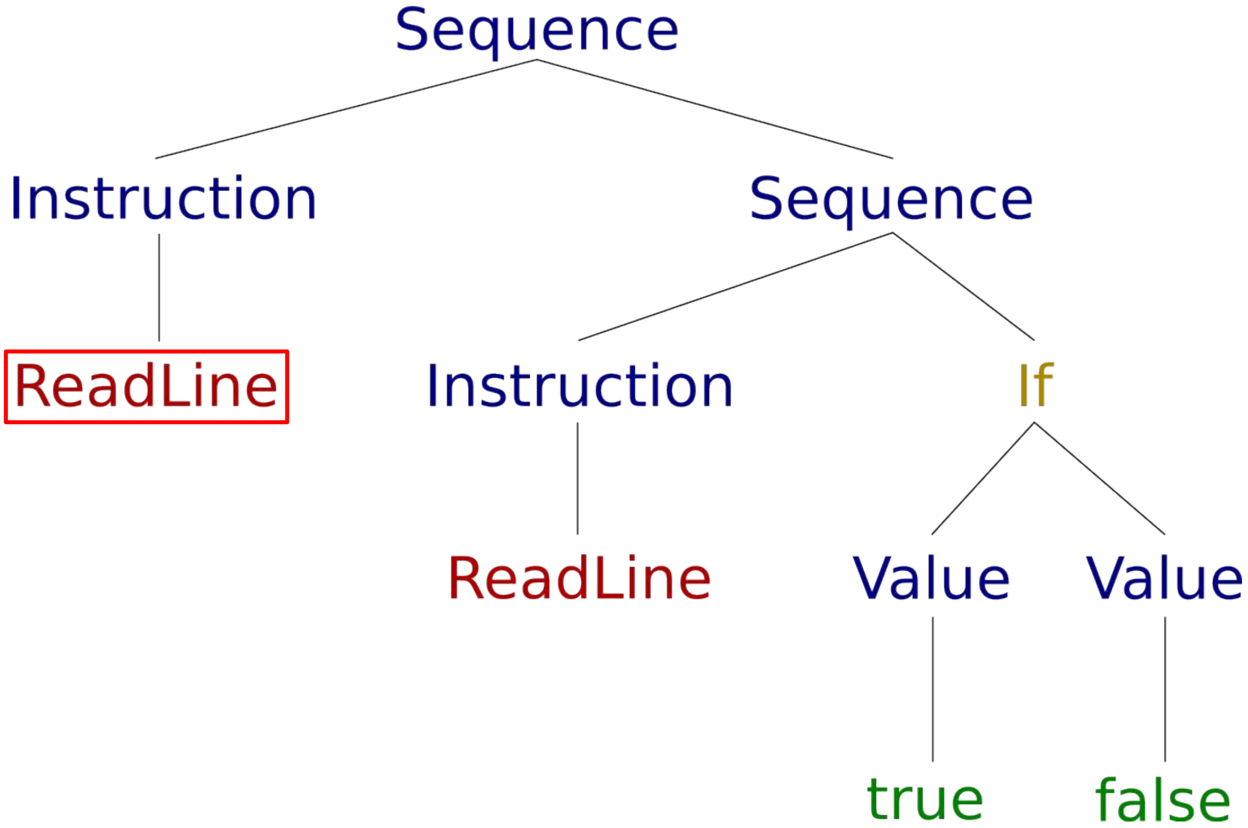

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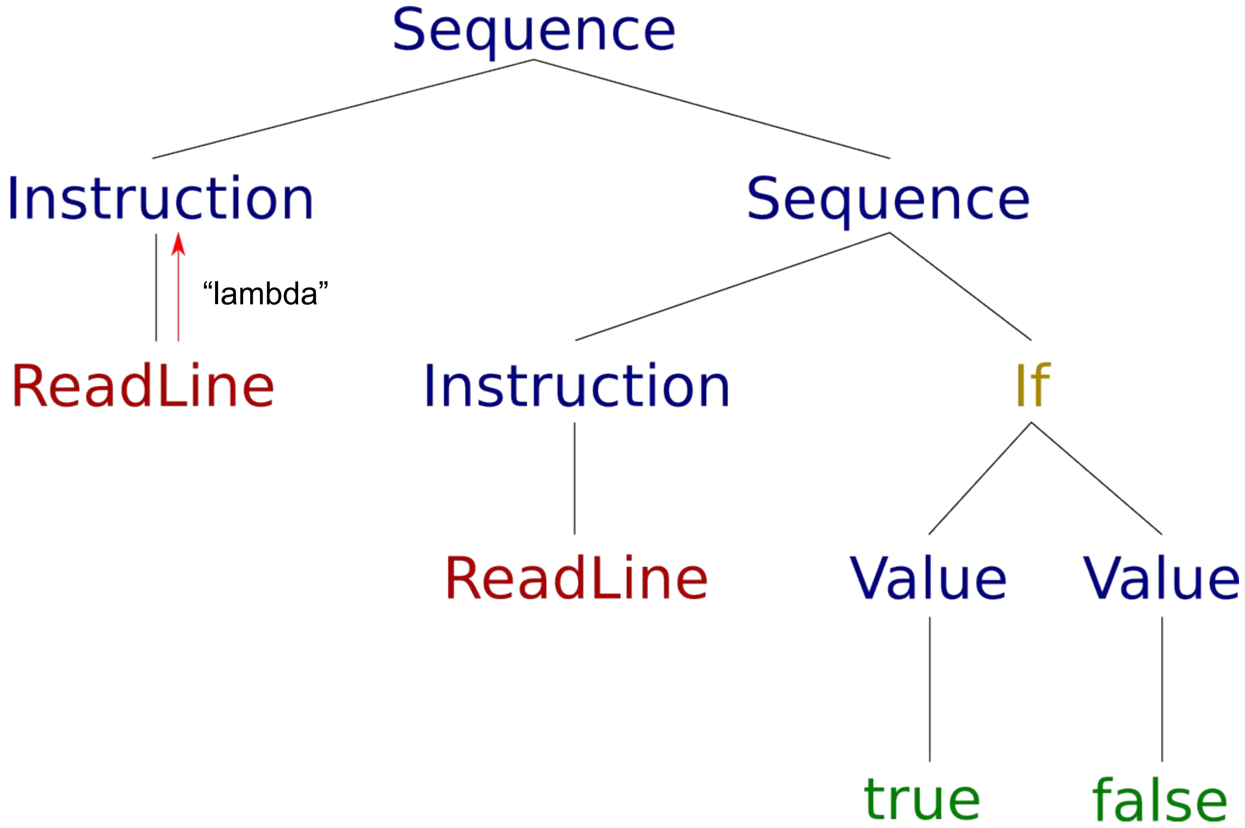

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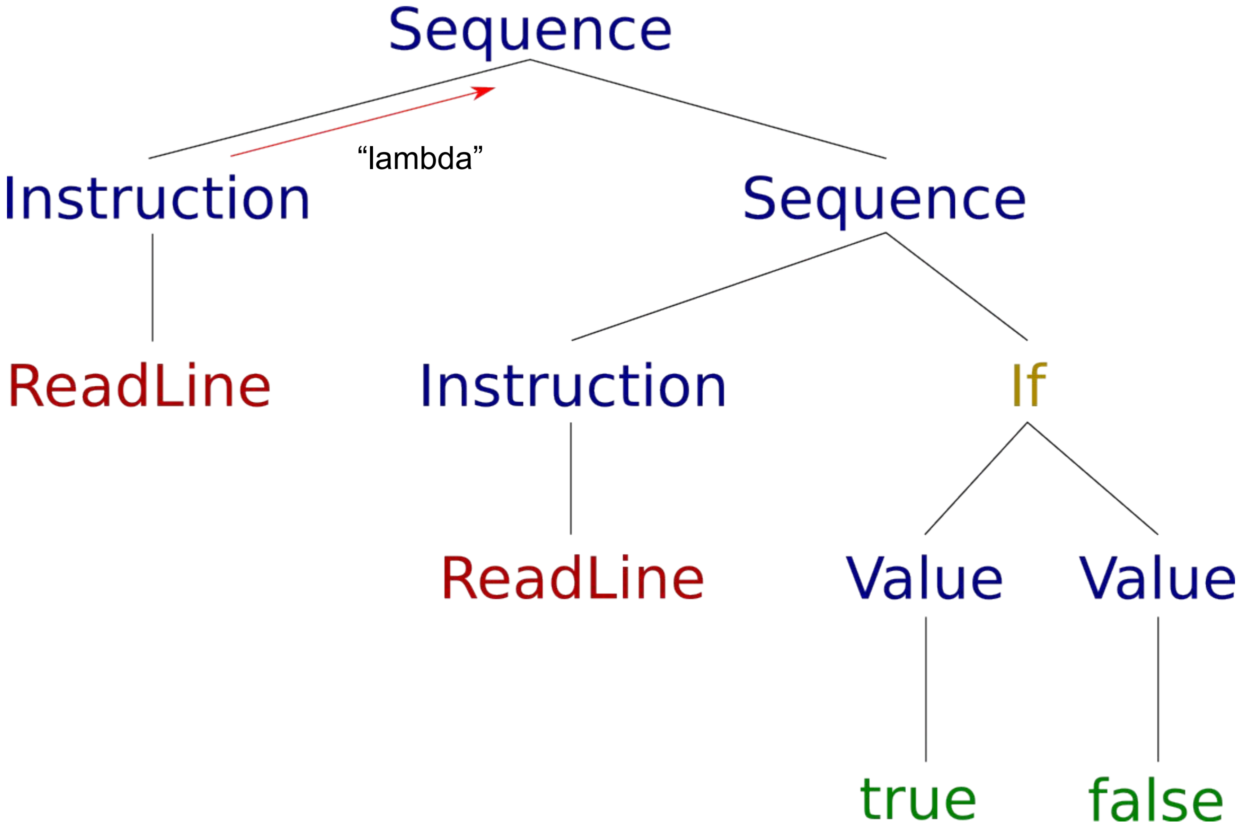

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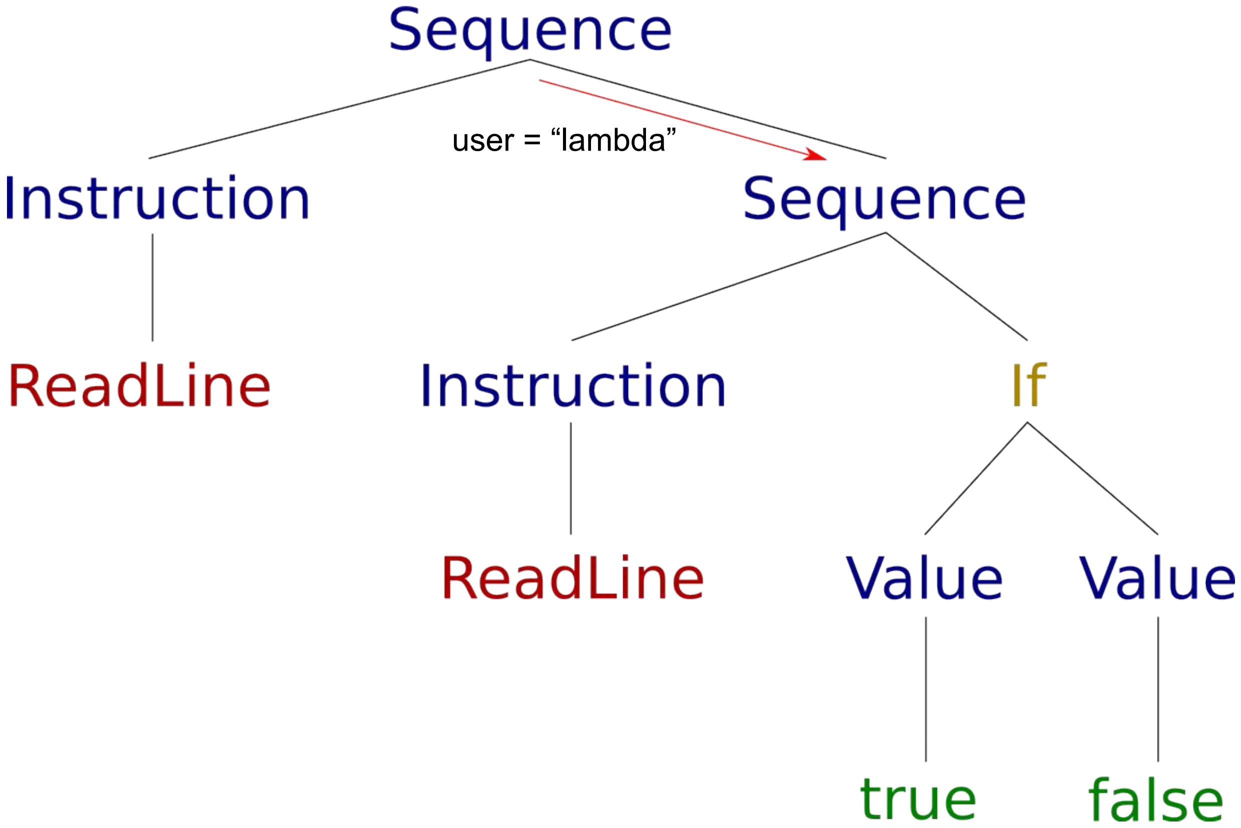

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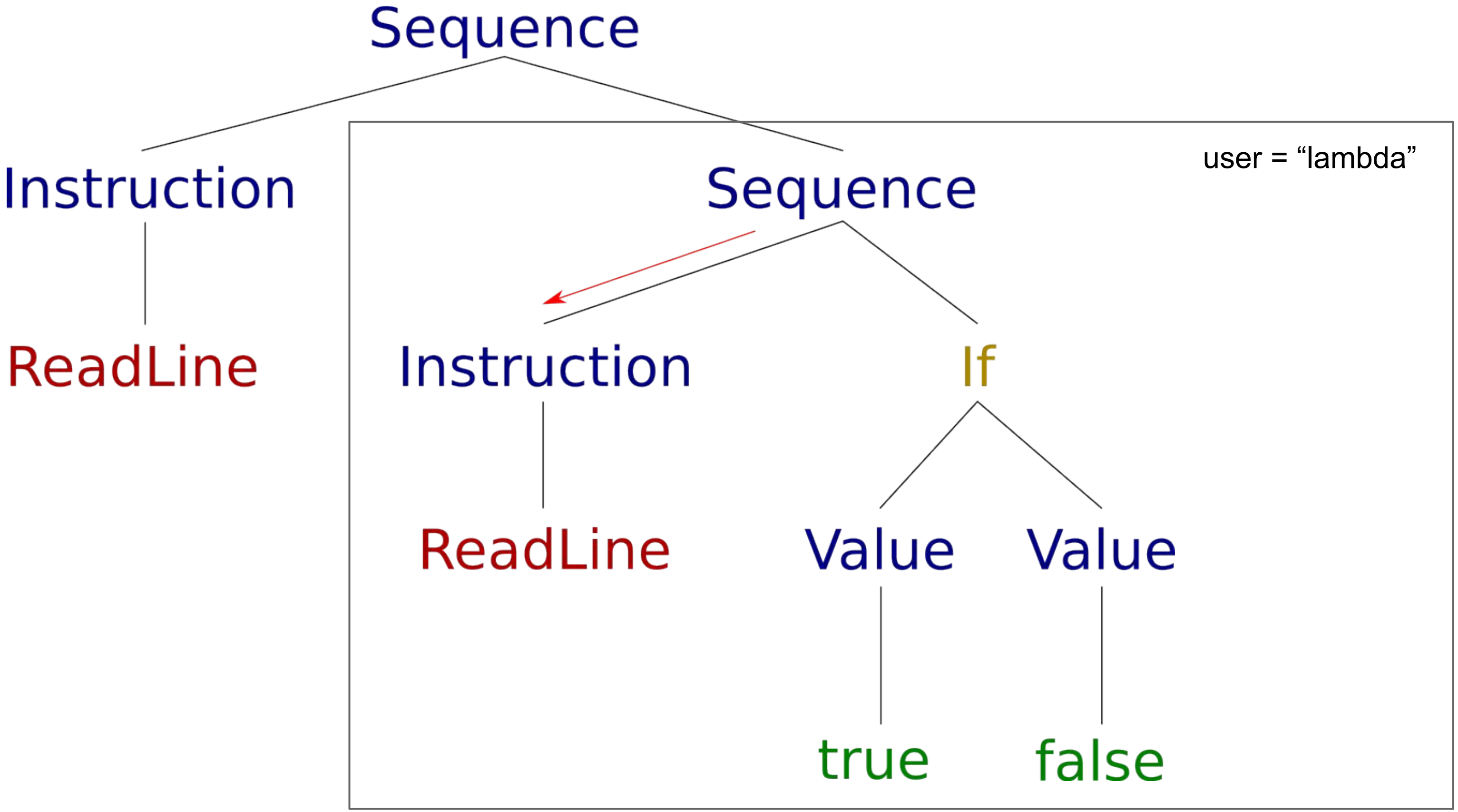

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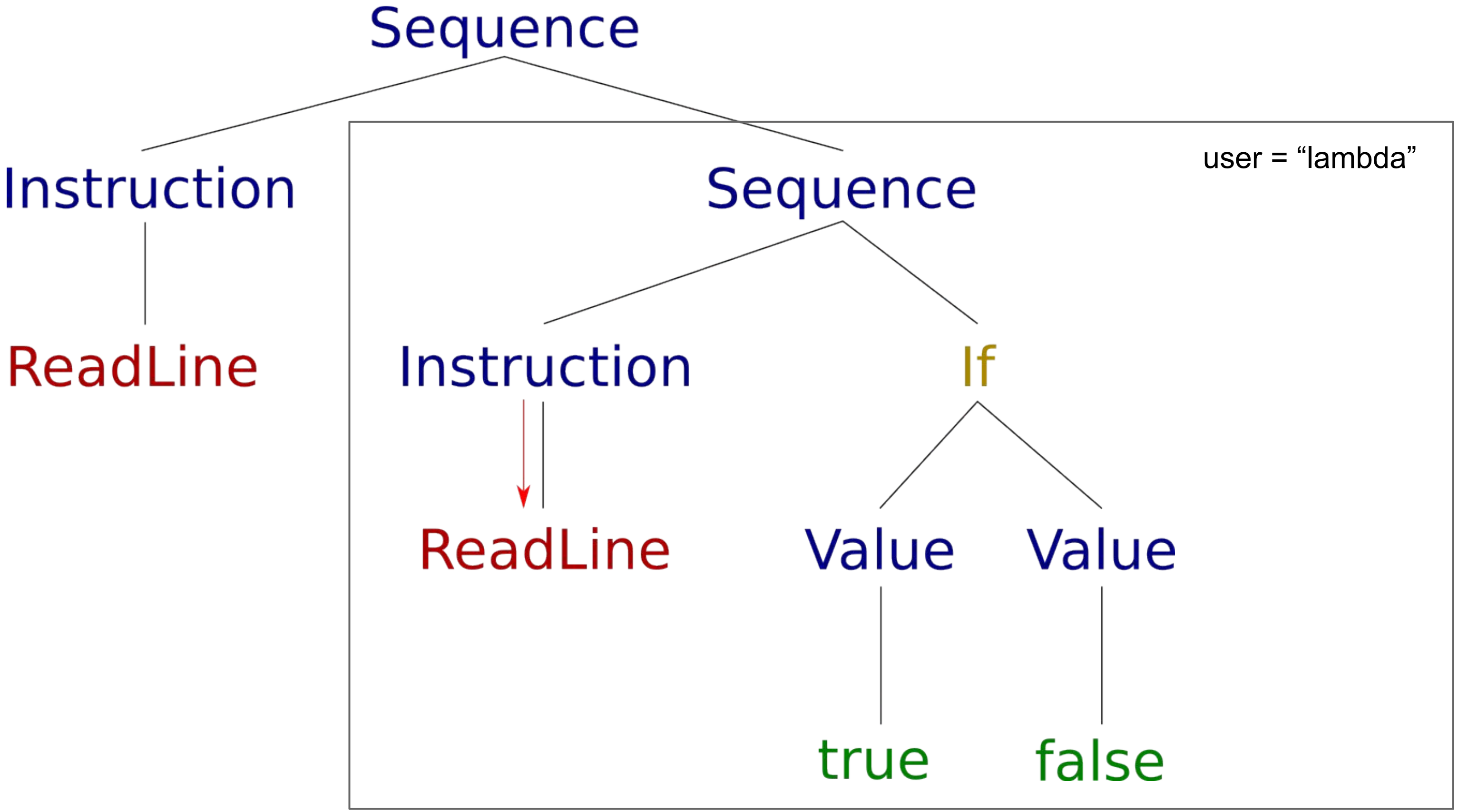

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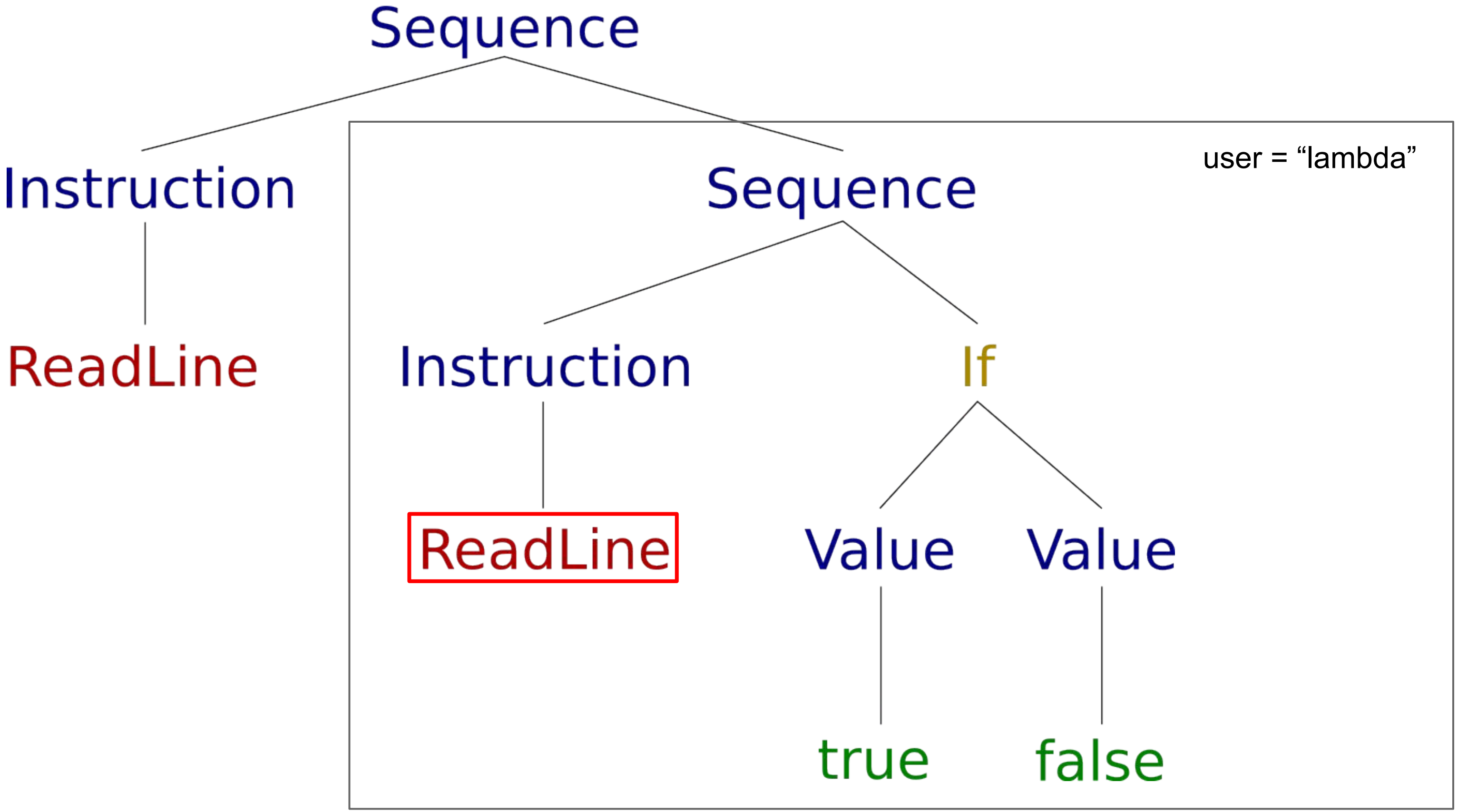

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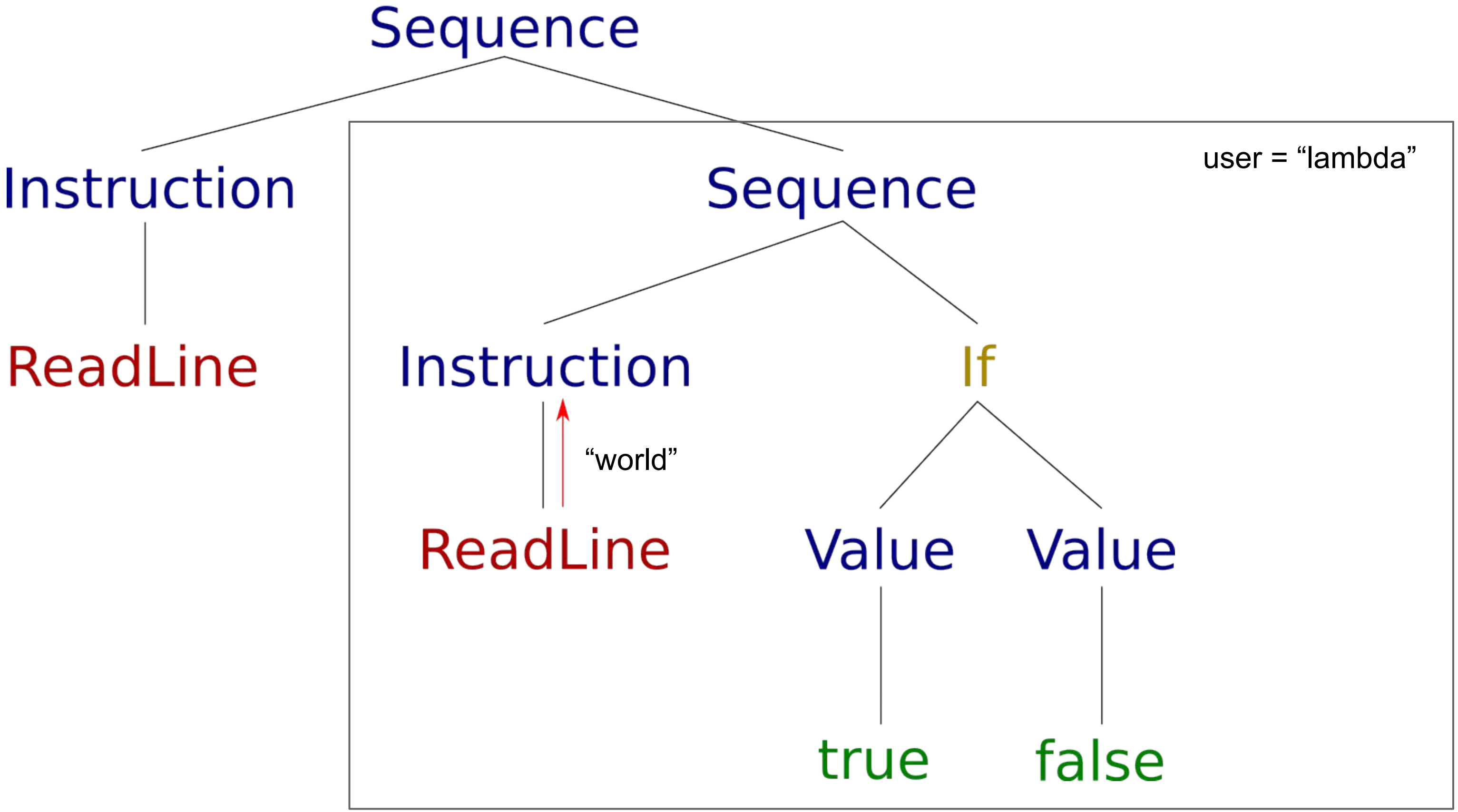

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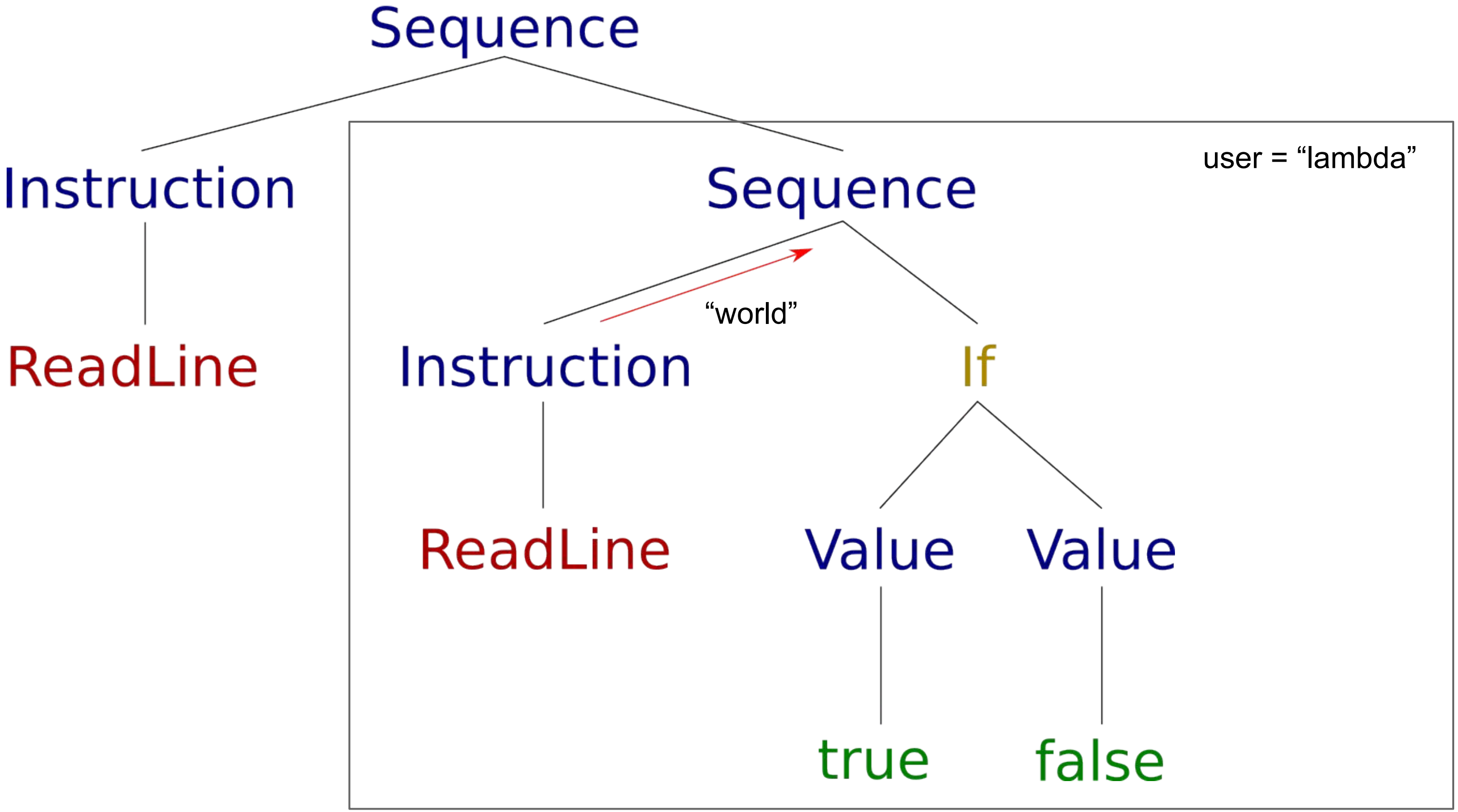

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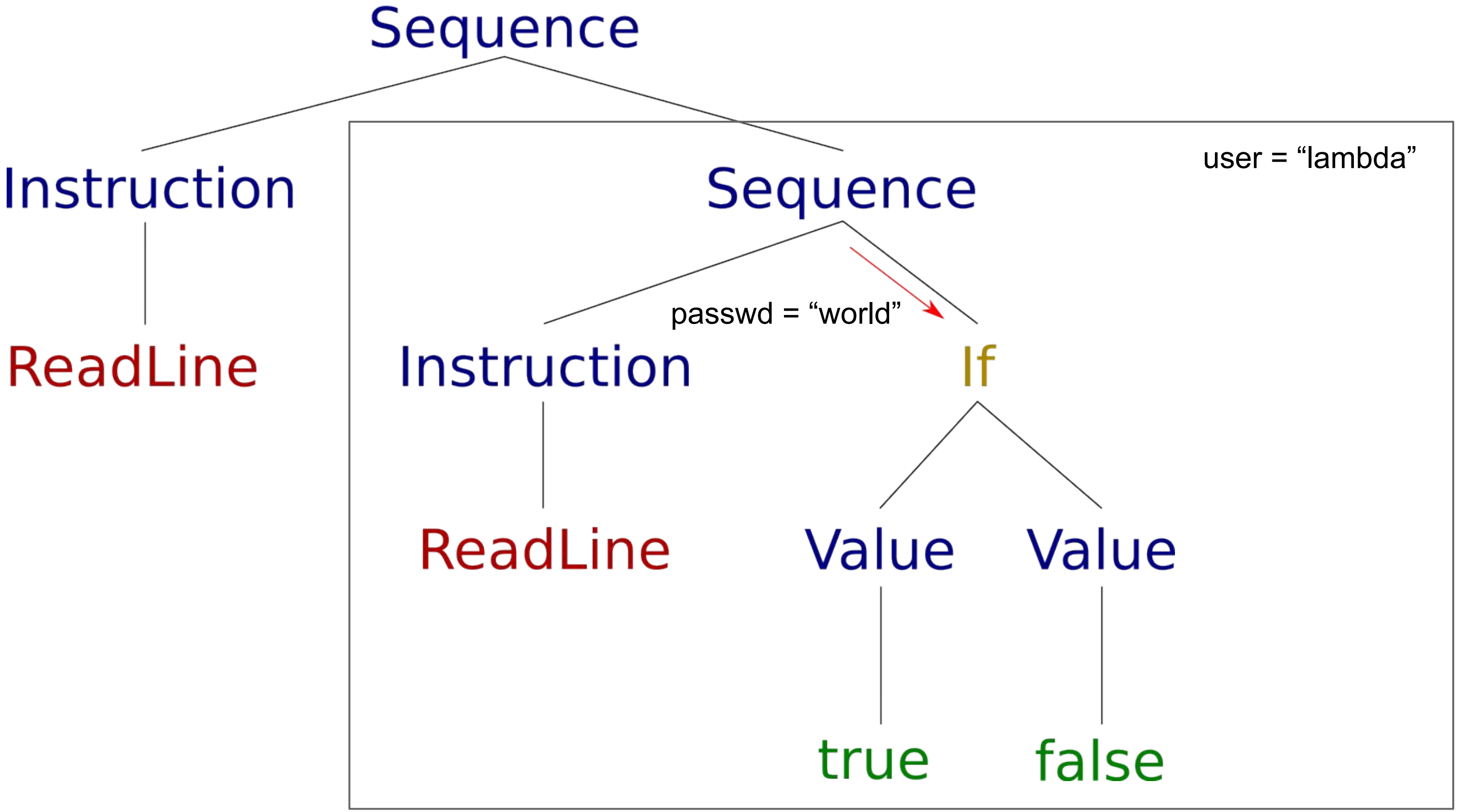

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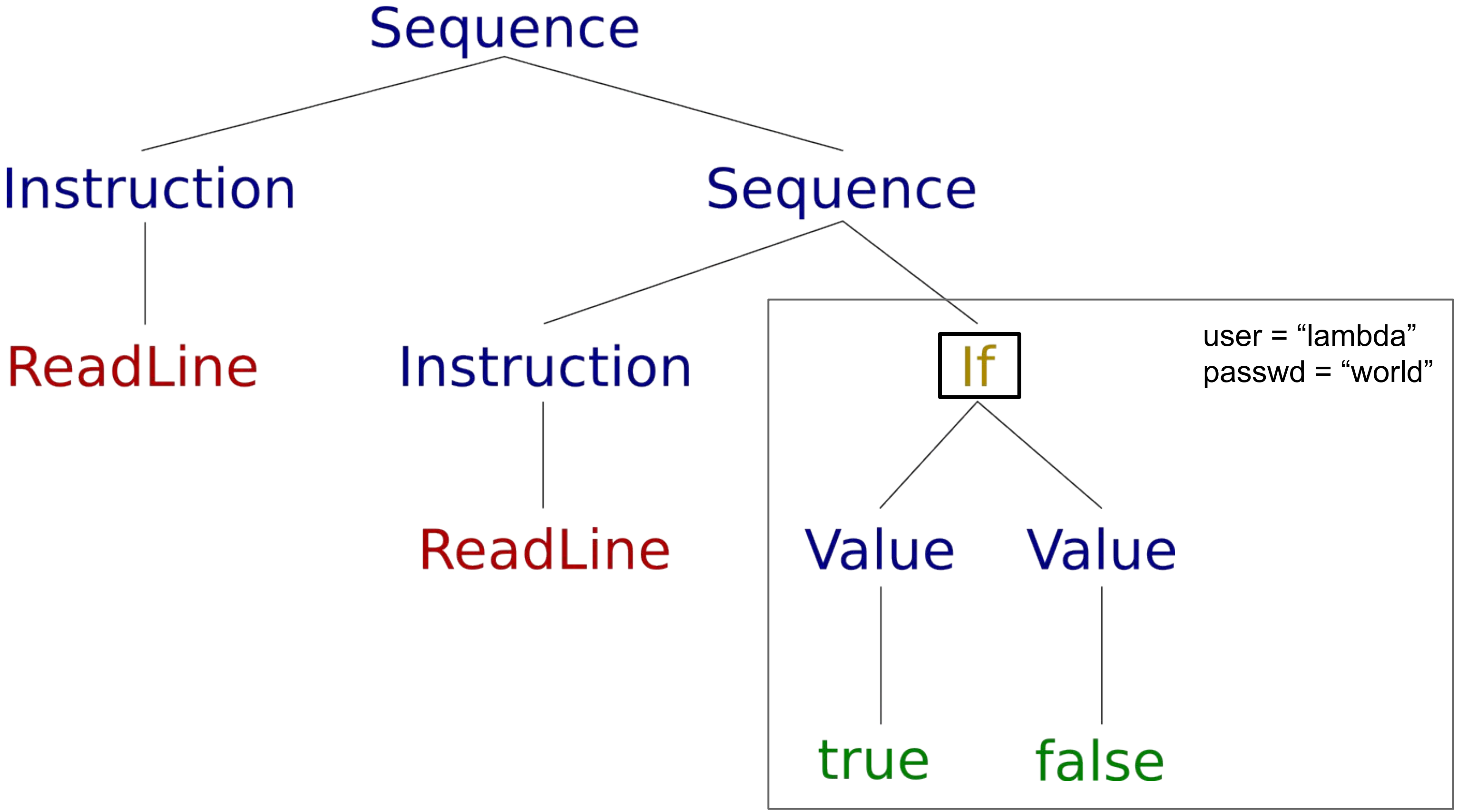

user = “lambda”
passwd = “world”

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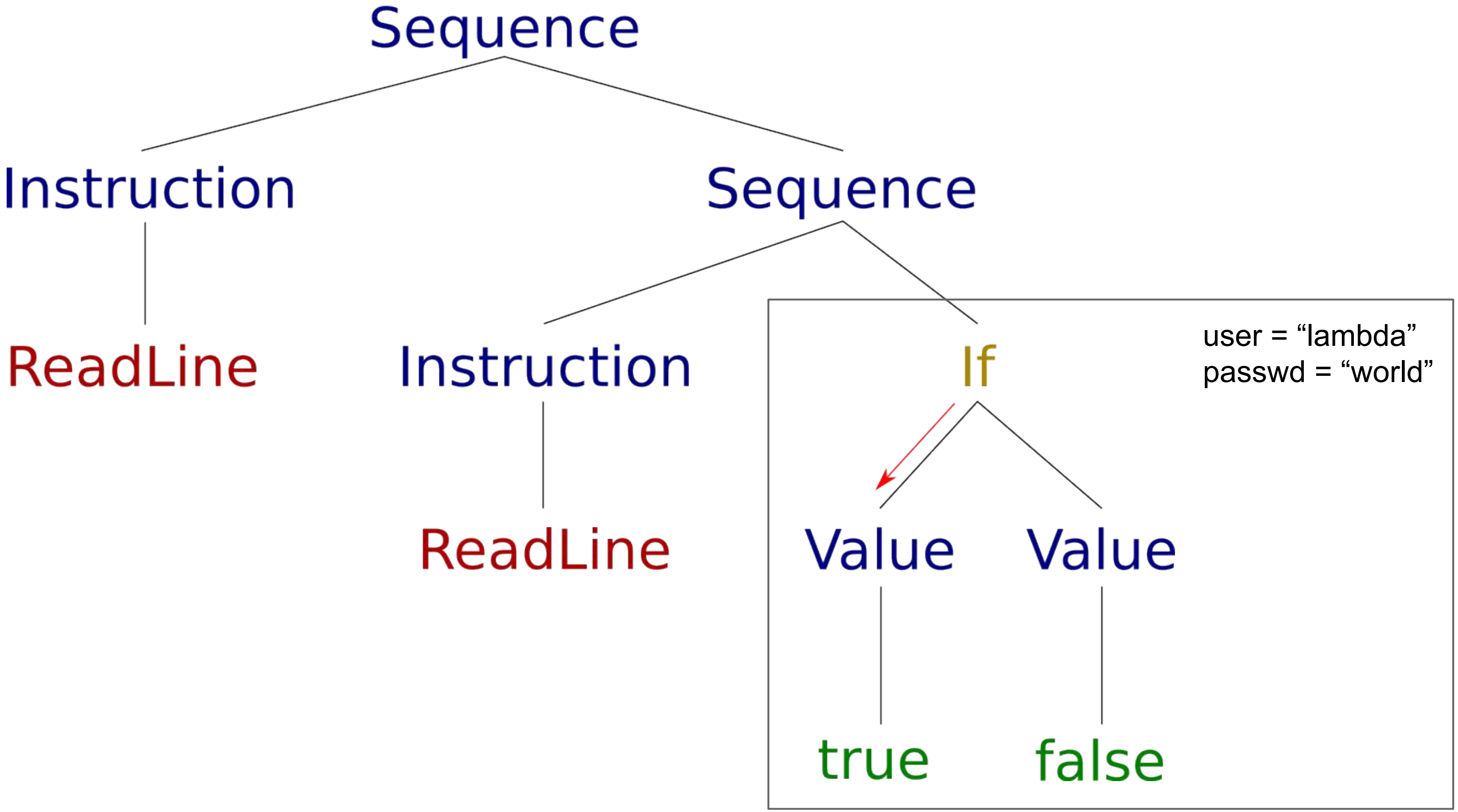

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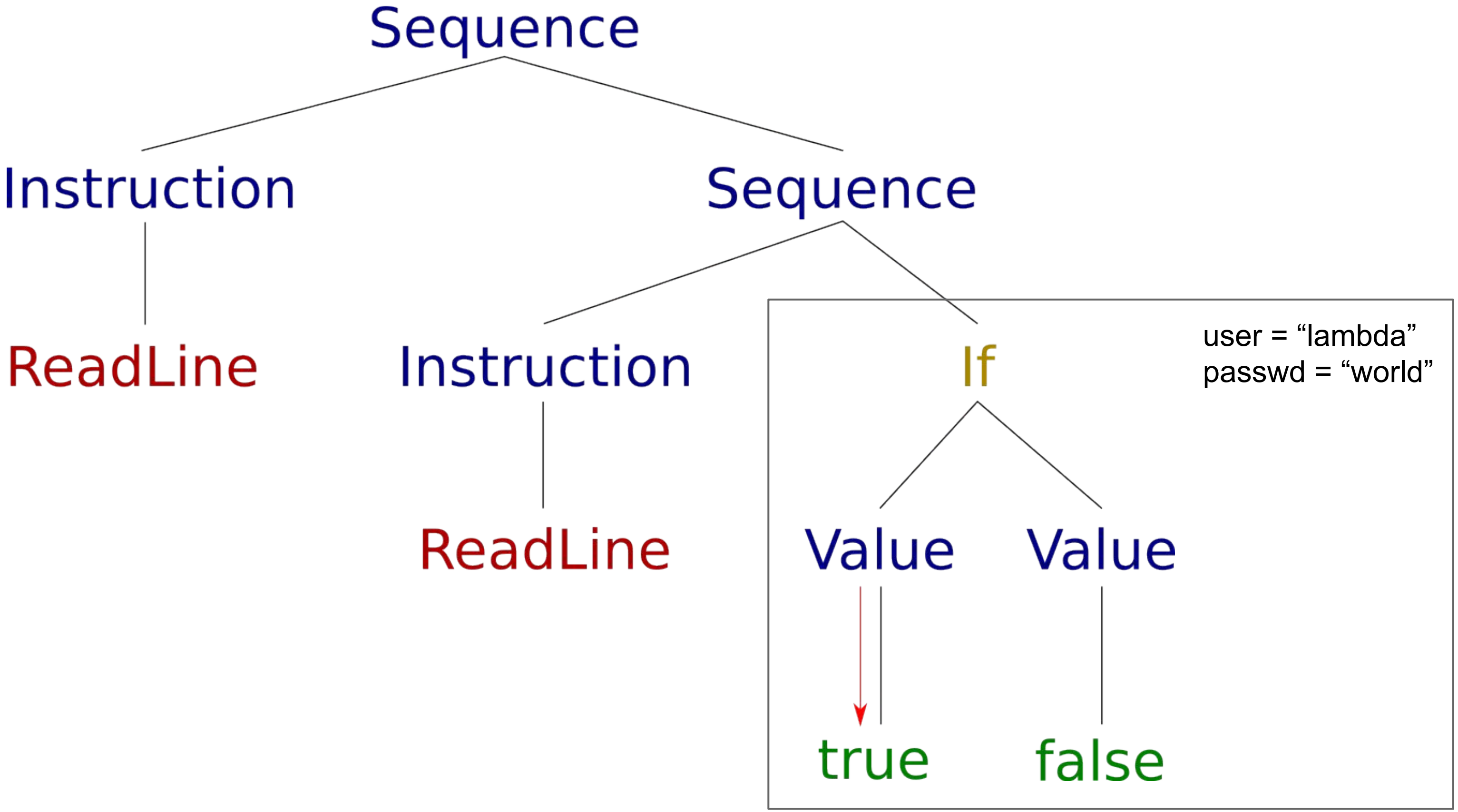

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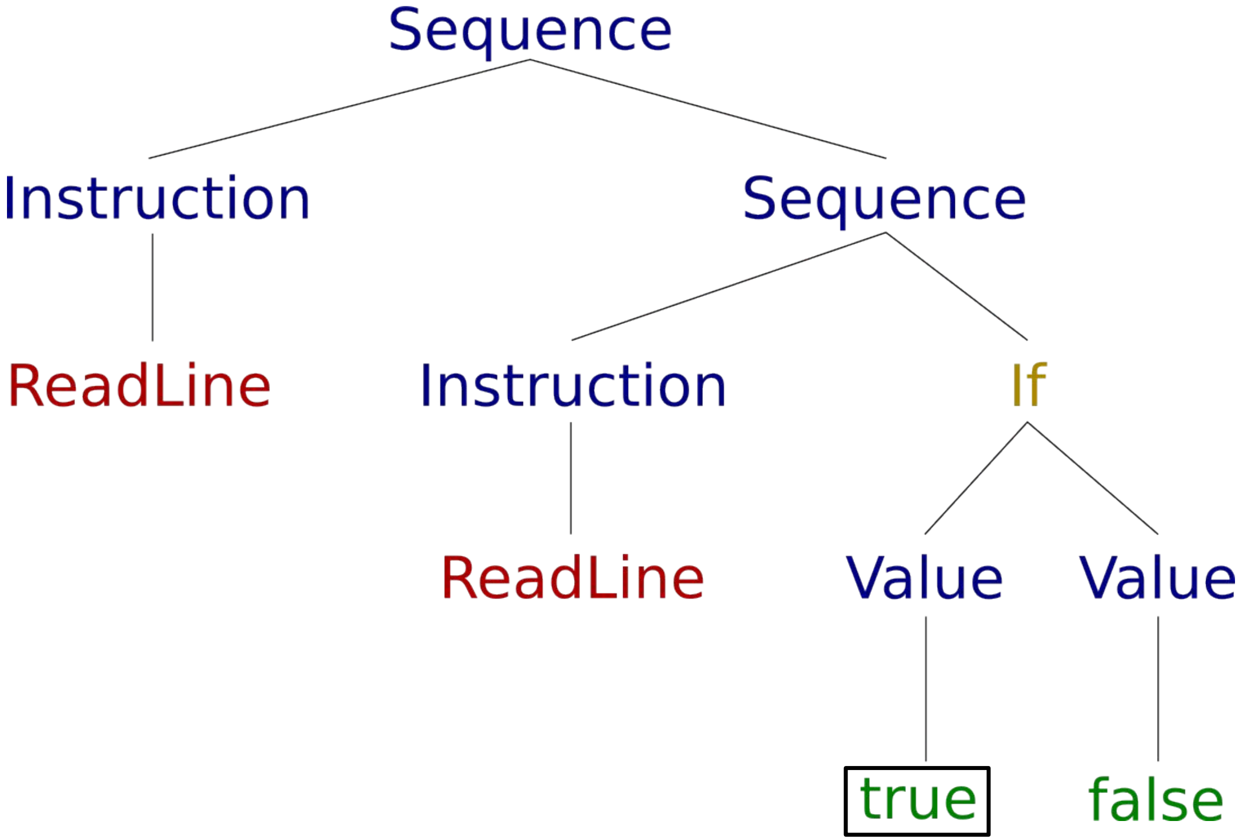

Have We Finished Yet?

Nope.

Sugaring Process Walkthrough

- **Step 6: Smart constructors**
- Step 7: Infix notation
- Step 8: for-comprehension syntax

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Bonus Track.
Bundle Up Your Library.

Final Step - Use Scalaz/Cats

- Our Program definition already exists out there
- It’s called Free Monad
- Scalaz/Cats implementation of Free is/has:
  - More efficient
  - Stack safe
  - Additional functionality

Conclusions

- We don’t lose expressiveness
- We don’t lose conciseness
- We gain flexibility
- Better decoupling
- Language + Interpreter > Interfaces

What's Next?

- Other free structures
- Combine your languages
  - Coproducts (Data types *“À la carte”*)
  - Monad transformers
- Kleislis
- ...

The End. Questions?