University of Amsterdam

Individual Written Assessment

Designing `legalease`, a Smart Contracts programming language

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Course:
Programmeertalen

1 Introduction

Smart Contracts [1] are key to simplify complex blockchain transactions. Smart contracts can streamline this complex process that involves several intermediaries because of a lack of trust among participants in the transaction. For this assignment I design a programming language that, in my view, matches the needs of smart contracts.

1.1 Relevant characteristics of application domain

1.2 Use case description

2 Analysis

2.1 The type system

Because smart contracts are designed for transactions, a smart contract needs to be accurate and secure. No hidden suprises at runtime. That is why I chose to have the language static typed. Static type checking has the advantages that the smart contract is guaranteed to meet a number of type safety features for all possible inputs. In addition, a static typing language is better optimized as opposed to dynamically typed language, because the compiler knows if a program is correctly typed. This results in a smaller and faster binary because no dynamic safety checks need to be performed.

While type inference does not affect runtime of a program, because types are inference occurs at compile-time, an explicit type inference seems to be the best choice for smart contracts because explicit type annotations serve as documentation for the code.

I also made the choice for nominative typing. While structural typing is more flexible, noimnative typing is less prone to errors. It's common for objects to be structural equivalent, but semanticily different. polymorphism can be implemented through a shared interface such as in the Java programming language.

2.2 State management

2.3 Compilation/interpretation strategy

2.4 Evaluation strategy (lazy/eager)

2.5 Parameter evaluation strategy (call by value/reference)

2.6 Communication semantics (synchronous/asynchronous)

2.7 Higher-order functions

2.8 Anonymous functions

3 Discussion

4 Conclusions

References

[1] PhD Nigel Gopie. "What are smart contracts on blockchain?" In: (2018). URL: https://www.ibm.com/blogs/blockchain/2018/07/what-are-smart-contracts-on-blockchain/.