

Chapter 1

Table of contents

- 1 Introduction
 - 1.1 Motivation
 - 1.2 Problem Definition
 - 1.3 Research Questions
 - 1.4 Non-Goals
 - 1.5 Research Methodology
 - 1.6 Structure of the thesis
- 2 Background
 - 2.1 Language Server Protocol
 - * 2.1.1 JSON-RPC
 - * 2.1.2 Commands and Notifications
 - * 2.1.3 Description of Key Methods
 - 2.1.3.1 Code Completion
 - 2.1.3.2 Hover
 - 2.1.3.3 Jump to Definition
 - 2.1.3.4 Find References
 - 2.1.3.5 Workspace/Document symbols
 - 2.1.3.6 Diagnostics
 - * 2.1.4 File Processing
 - 2.2 Text based Configuration
 - * 2.2.1 Common Configuration Languages
 - 2.2.1.1 JSON
 - 2.2.1.2 YAML
 - * 2.2.2 Applications of Configuration Languages
 - * 2.2.3 Configuration Programming Languages
 - * 2.2.4 Infrastructure as Code
 - * 2.2.5 Nickel
 - 2.2.5.1 Nickel AST
 - 2.2.5.2 Record Merging
 - 2.2.5.3 Gradual typing
 - 2.2.5.4 Contracts
- 3 Related work
 - 3.1 IDE Support

- * 3.1.1 Native and Plugin Systems
 - * 3.1.2 Server Client Abstractions
 - 3.1.2.1 Monto
 - 3.1.2.2 Merlin
- 3.2 Language Servers
 - * 3.2.1 Integrating with the Compiler/Runtime
 - 3.2.1.1 HLS
 - 3.2.1.2 Ocaml LSP
 - 3.2.1.3 Rust-Analyzer
 - 3.2.1.4 Frege LSP
 - 3.2.1.5 Runtime-independent LSP implementations
 - 3.2.1.6 Language Server as an Interface to CLI tools
 - 3.2.1.7 CPAchecker
 - 3.2.1.8 CodeCompass
 - * 3.2.2 Language Servers generation for Domain Specific Languages
- 3.3 Alternative approaches
 - * 3.3.1 LSP Extensions
 - * 3.3.2 Language Server Index Format
 - * 3.3.3 Abstracting software development processes
- 3.4 References
- 4 Design and Implementation
 - 4.1 Key Objectives
 - * 4.1.1 Performance
 - * 4.1.2 Capability
 - * 4.1.3 Flexibility
 - * 4.1.4 Generalizability
 - 4.2 Design Decisions
 - * 4.2.1 Programming language
 - * 4.2.2 File processing
 - * 4.2.3 Code Analysis
 - 4.3 High-Level Architecture
 - 4.4 Illustrative example
 - 4.5 Linearization
 - * 4.5.1 States
 - * 4.5.2 Transfer from AST
 - 4.5.2.1 Usage Graph
 - 4.5.2.2 Scopes
 - 4.5.2.3 Linearizer
 - 4.5.2.4 Linearization Process
 - * 4.5.3 Post-Processing
 - 4.5.3.1 Sorting
 - 4.5.3.2 Resolving deferred access
 - 4.5.3.3 Resolving types
 - * 4.5.4 Resolving Elements
 - 4.5.4.1 Resolving by position
 - 4.5.4.2 Resolving by ID
 - 4.5.4.3 Resolving by scope
 - 4.6 LSP Server Implementation
 - * 4.6.1 Server Interface
 - * 4.6.2 Diagnostics and Caching

- * 4.6.3 Commands
 - 4.6.3.1 Hover
 - 4.6.3.2 Jump to Definition and Show references
 - 4.6.3.3 Completion
 - 4.6.3.4 Document Symbols
- 5 Evaluation
 - 5.1 Evaluation Considerations
 - 5.2 Methods
 - * 5.2.1 Objectives
 - * 5.2.2 Qualitative Evaluation Setup
 - 5.2.2.1 Pre-Evaluation
 - 5.2.2.2 Experience Survey
 - * 5.2.3 Quantitative
 - 5.3 Results
 - * 5.3.1 Qualitative
 - 5.3.1.1 Pre-Evaluation
 - 5.3.1.2 Experience Survey
 - * 5.3.2 Quantitative
 - 5.3.2.1 Dataset
 - 5.3.2.2 Big Picture Latencies
 - 5.3.2.3 Special cases
 - 5.4 Discussion
 - * 5.4.1 Diagnostics
 - * 5.4.2 Cross File Navigation
 - * 5.4.3 Autocompletion
 - * 5.4.4 Performance
- 6 Discussion
 - 6.1 Project results
 - 6.2 Project shortcomings
 - Future Work

