## Chapter 1

## Table of contents

- 1 Introduction
  - 1.1 Motivation
    - \* 1.1.1 Problem Definition
  - 1.2 Research Questions
  - 1.3 Non-Goals
  - 1.4 Research Methodology
  - 1.5 Structure of the thesis
- 2 Background
  - 2.1 Language Server Protocol
    - \* 2.1.1 JSON-RPC
    - \* 2.1.2 Commands and Notifications
      - · 2.1.2.1 File Notification
      - · 2.1.2.2 Hover
      - $\cdot$  2.1.2.3 Completion
      - · 2.1.2.4 Go-To-\*
      - · 2.1.2.5 Symbols
      - $\cdot$  2.1.2.6 code lenses
    - \* 2.1.3 Shortcomings
  - 2.2 Configuration programming languages
    - $\ast~2.2.1$ Infrastructure as Code
    - \* 2.2.2 Nickel
      - $\cdot$  2.2.2.1 Gradual typing
      - $\cdot \ \ 2.2.2.2 \ Contracts$
      - $\cdot$  2.2.2.3 Nickel AST
- 3 Related work
  - 3.1 Language Servers
    - \* 3.1.1 Considerable dimensions
      - · 3.1.1.1 Language Complexity
    - $\ast~3.1.2$  Representative LSP Projects
      - $\cdot$  3.1.2.1 LSP as standard tooling
      - · 3.1.2.2 Rapid implementation of LSP features
      - · 3.1.2.3 Language Independence
      - $\cdot~$  3.1.2.4 Language Servers for Domain Specific Languages

- \* 3.1.3 Honorable mentions
- 3.2 Alternative approaches
  - \* 3.2.1 Platform plugins
  - \* 3.2.2 Legacy protocols
  - \* 3.2.3 LSP Extensions
  - \* 3.2.4 LSIF
- 4 Design implementation of NLS
  - 4.1 Illustrative example
  - 4.2 Linearization
    - \* 4.2.1 States
    - \* 4.2.2 Transfer from AST
      - · 4.2.2.1 Usage Graph
      - · 4.2.2.2 Scopes
      - · 4.2.2.3 Linearizer
      - · 4.2.2.4 Linearization Process
    - \* 4.2.3 Post-Processing
      - · 4.2.3.1 Sorting
      - · 4.2.3.2 Resolving deferred access
      - · 4.2.3.3 Resolving types
    - \* 4.2.4 Resolving Elements
      - · 4.2.4.1 Resolving by position
      - $\cdot$  4.2.4.2 Resolving by ID
      - · 4.2.4.3 Resolving by scope
  - 4.3 LSP Server
    - \* 4.3.1 Diagnostics and Caching
    - \* 4.3.2 Commands
      - · 4.3.2.1 Hover
      - · 4.3.2.2 Jump to Definition and Show references
      - $\cdot$  4.3.2.3 Completion
      - · 4.3.2.4 Document Symbols
- 5 Evaluation
  - 5.1 Values of Interest
  - 5.2 Methods
    - \* 5.2.1 Qualitative
    - \* 5.2.2 Quantitative
  - 5.3 Process
  - 5.4 Results
    - \* 5.4.1 Qualitative
    - \* 5.4.2 Quantitative
- 6 Discussion
  - 6.1 Project results
  - 6.2 Project shortcomings
  - 6.3 Future Work