Fifteen Years of VIPER

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Verification
Infrastructure for
PERmission-Based Reasoning

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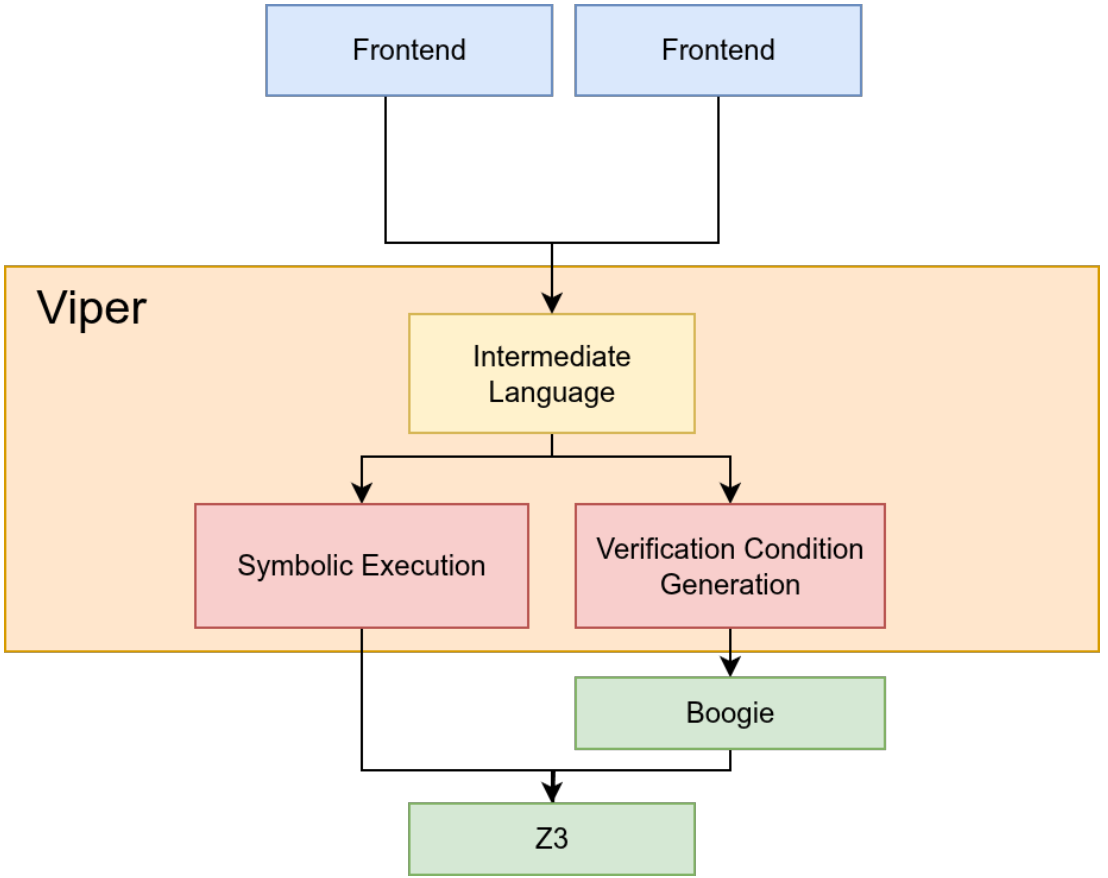
Infrastructure for
PERmission-Based Reasoning
(based on Separation Logic)

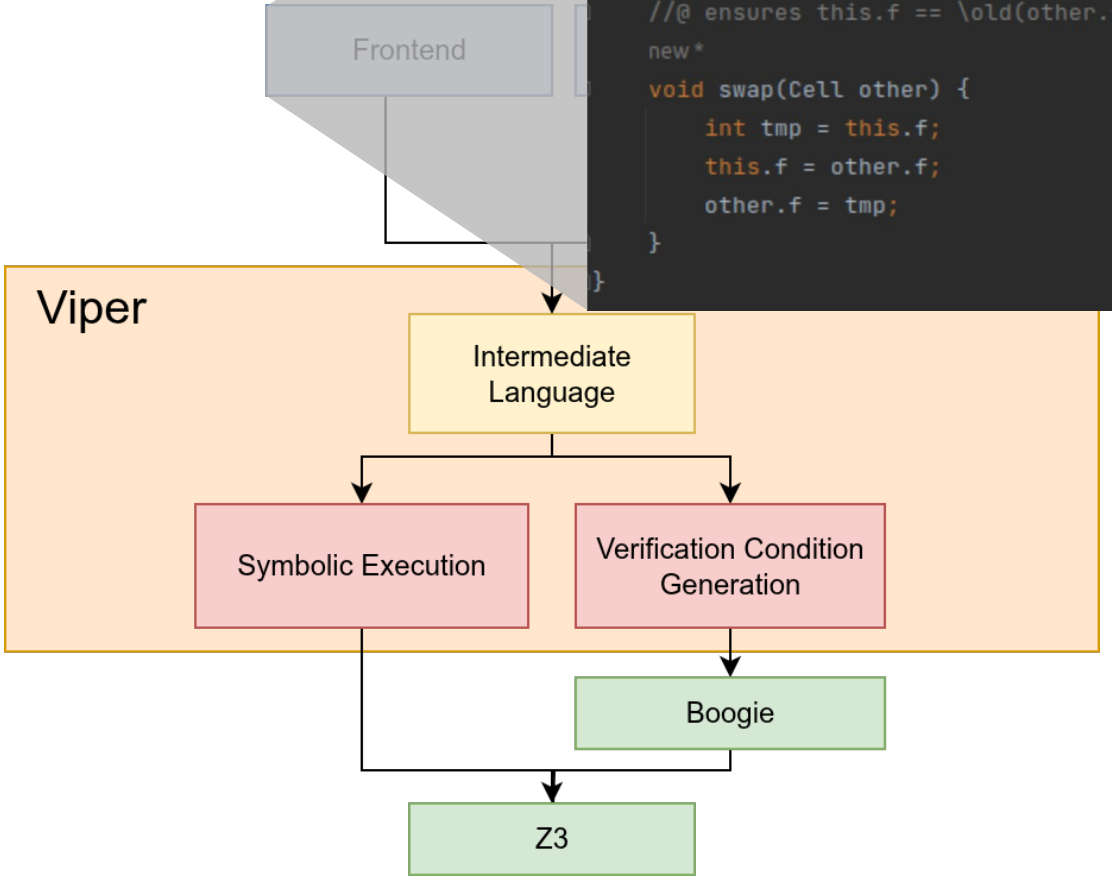
The Viper Verification Infrastructure



The Viper Verification Infra

```
class Cell {
    4 usages
    private int f;

    //@ context Perm(f, write) ** Perm(other.f, write);
    //@ ensures this.f == \old(other.f) ** other.f == \old(this.f);
    new*
    void swap(Cell other) {
        int tmp = this.f;
        this.f = other.f;
        other.f = tmp;
    }
}
```



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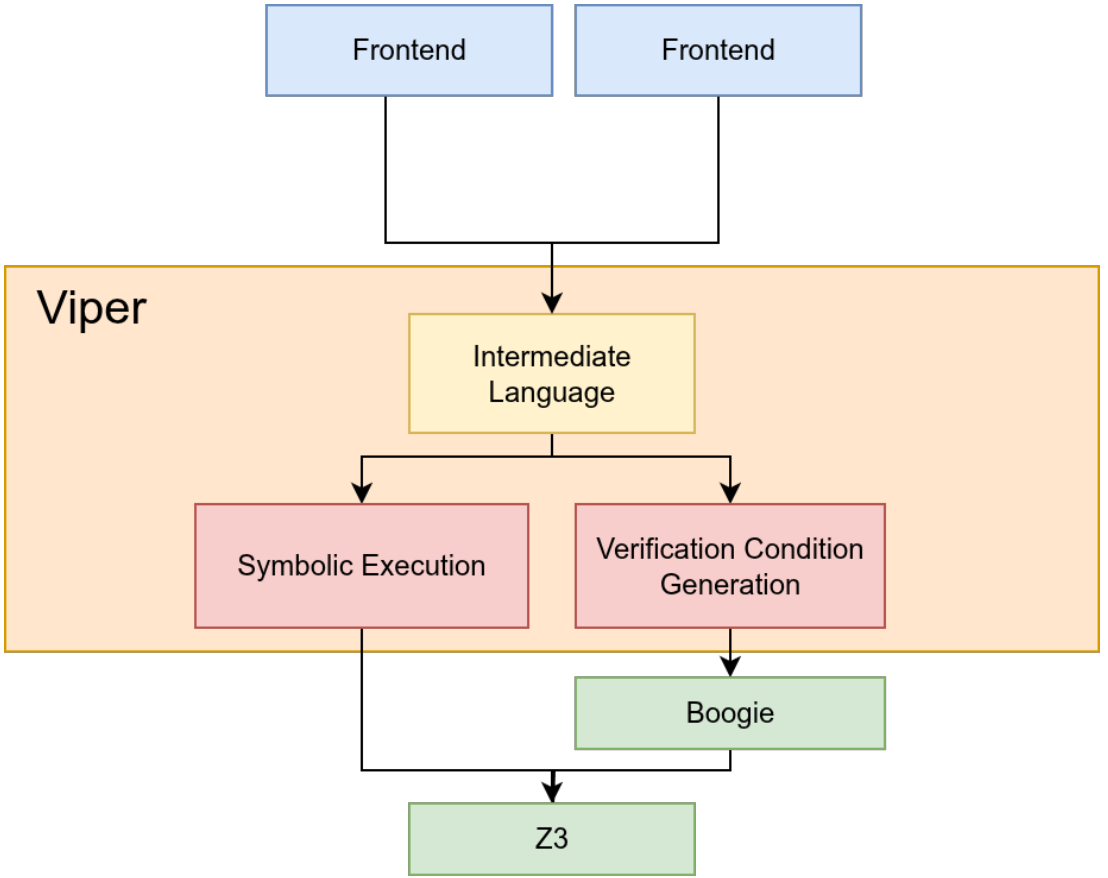

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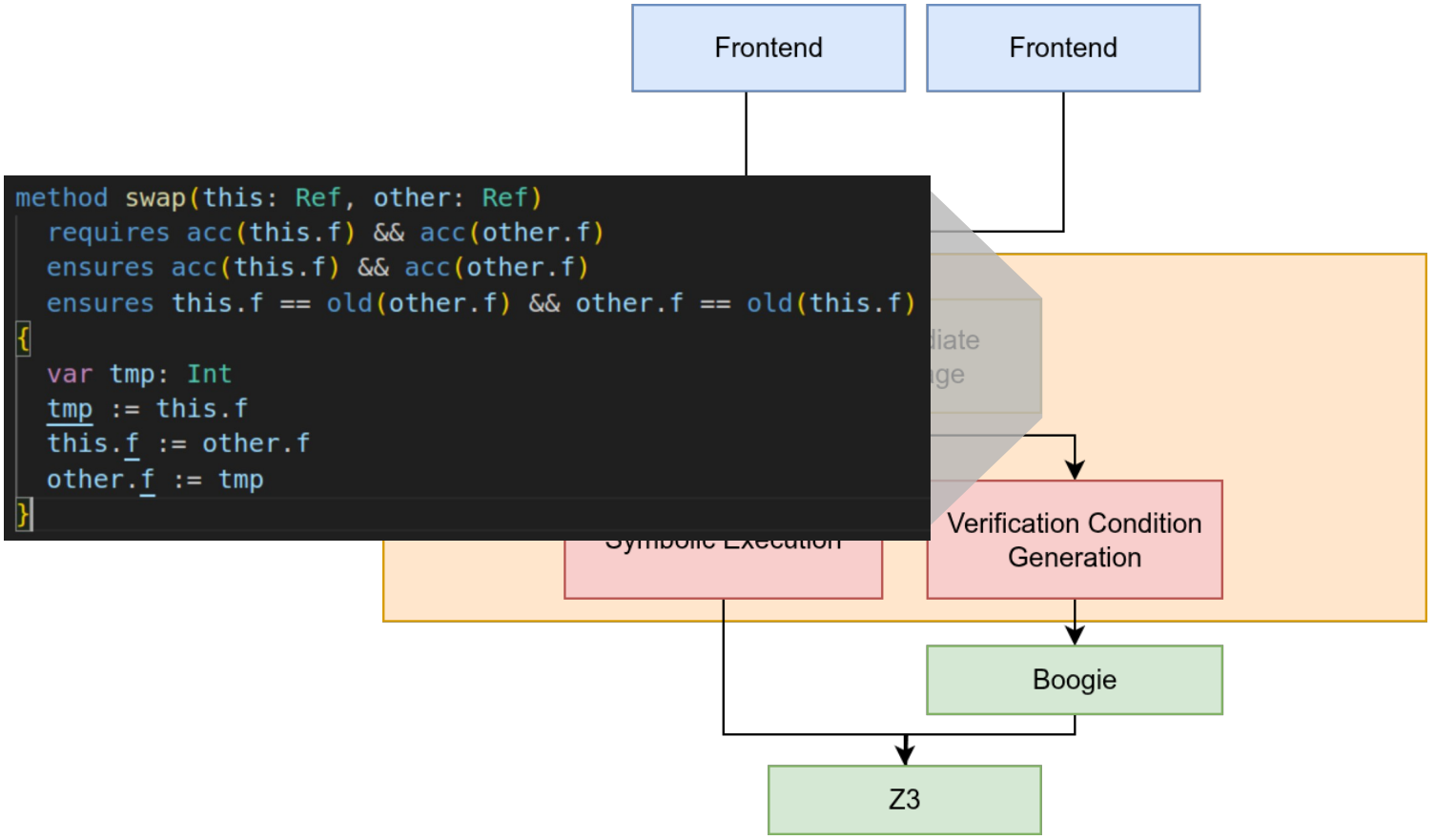

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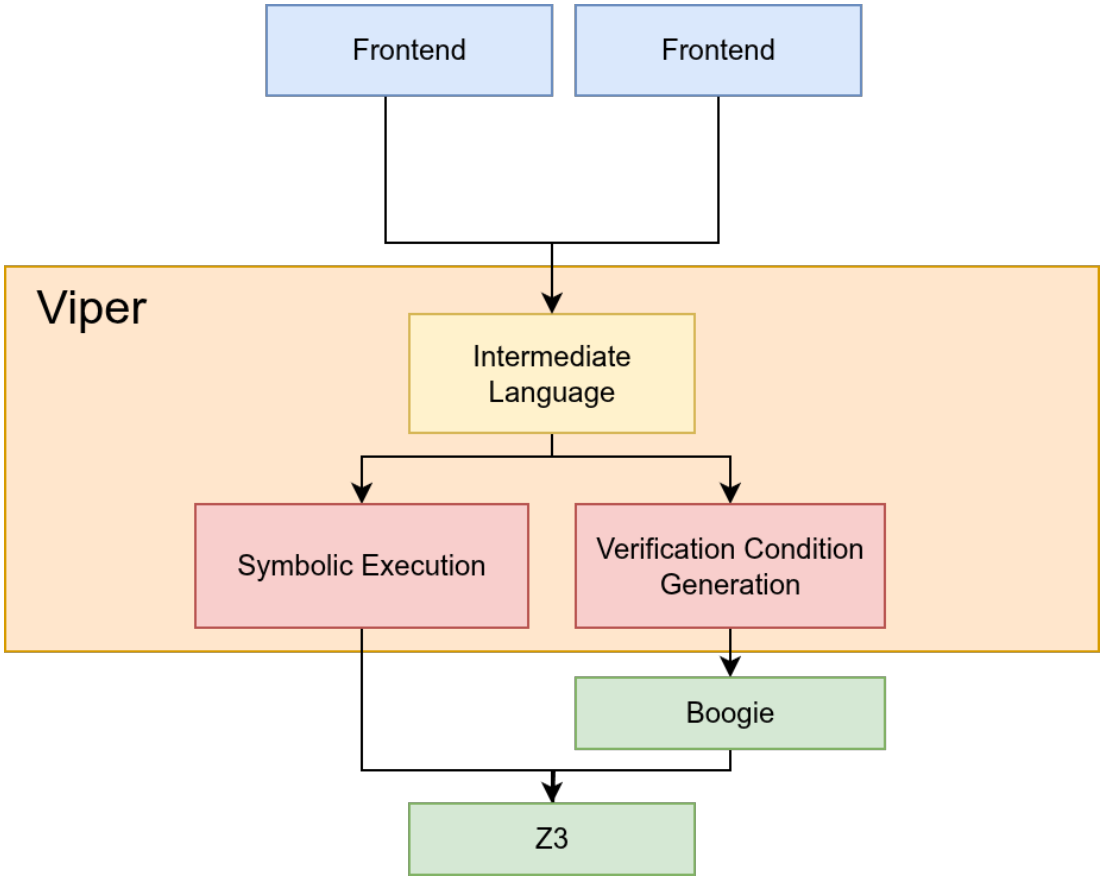
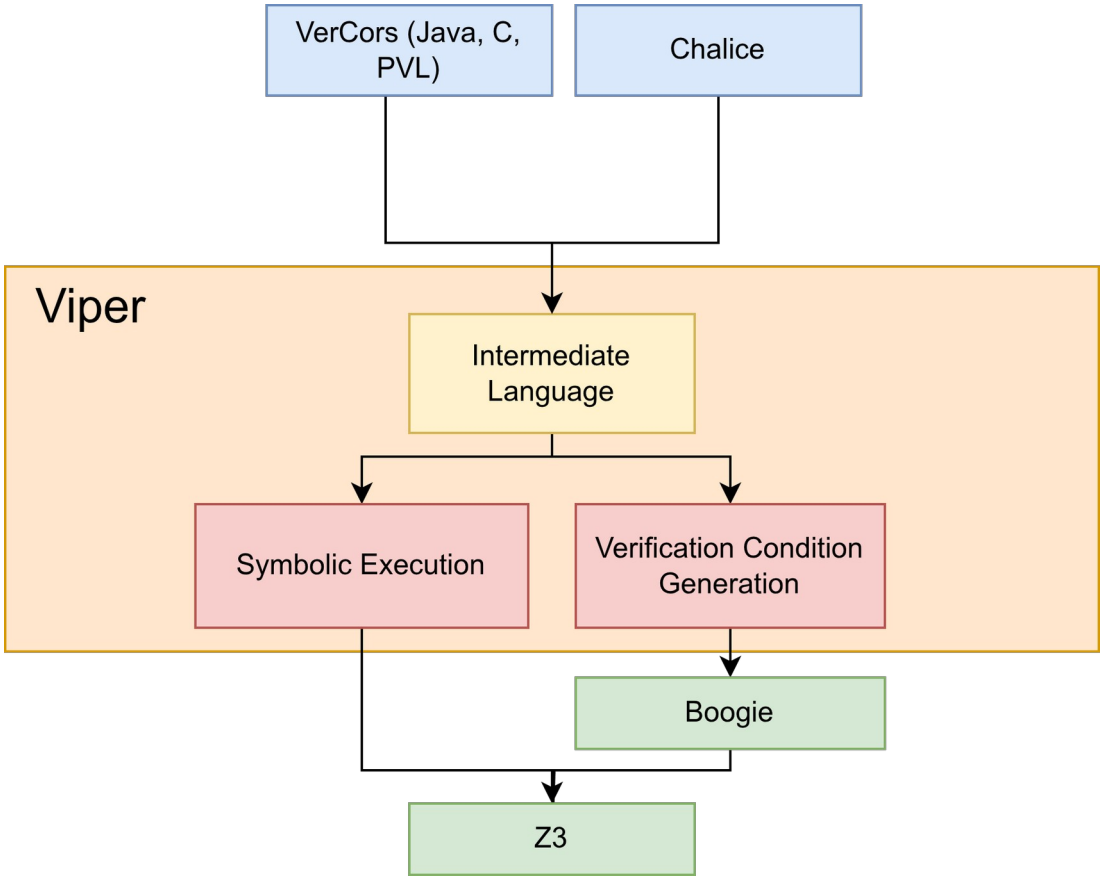
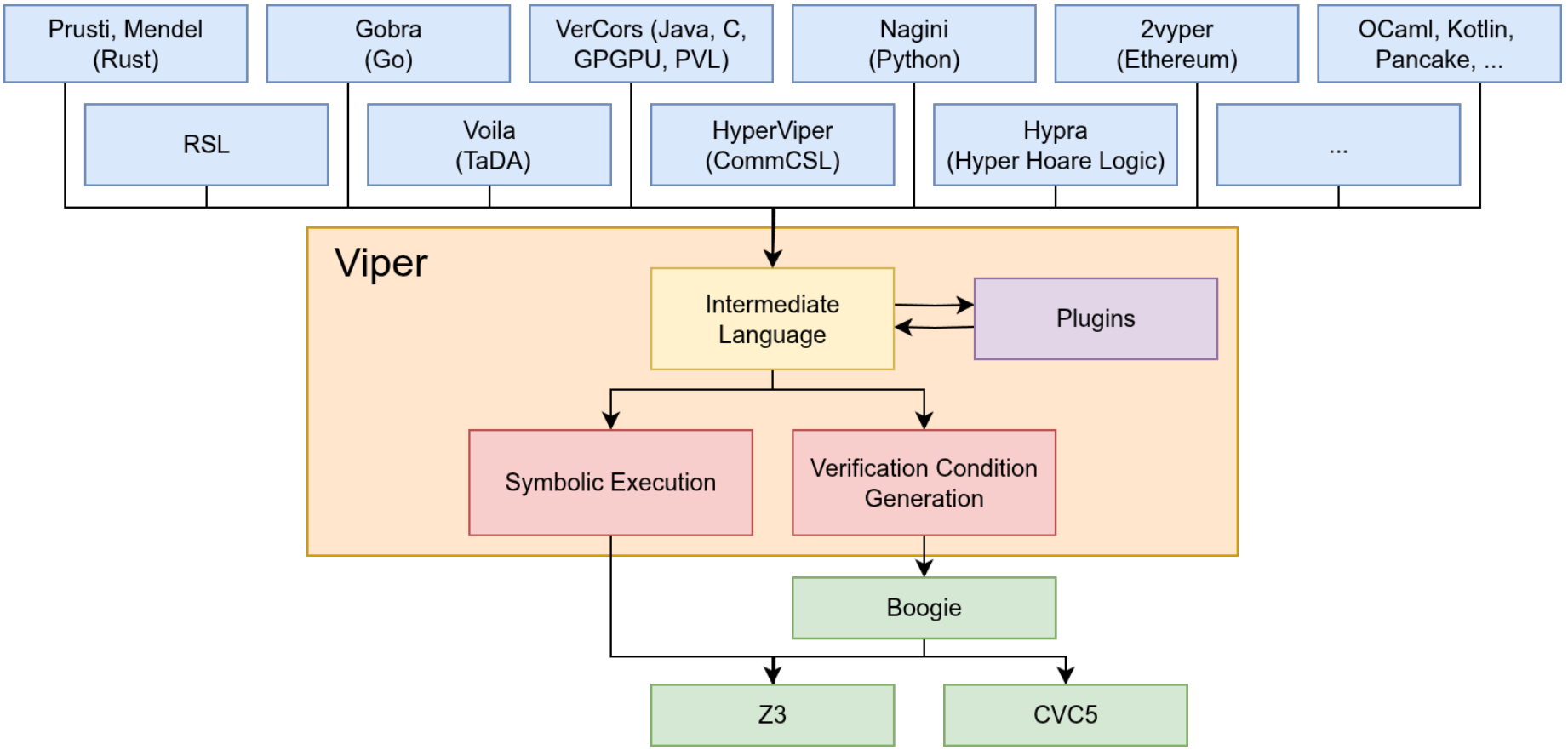


The Viper Verification Infrastructure (2016)



The Viper Verification Infrastructure (today)

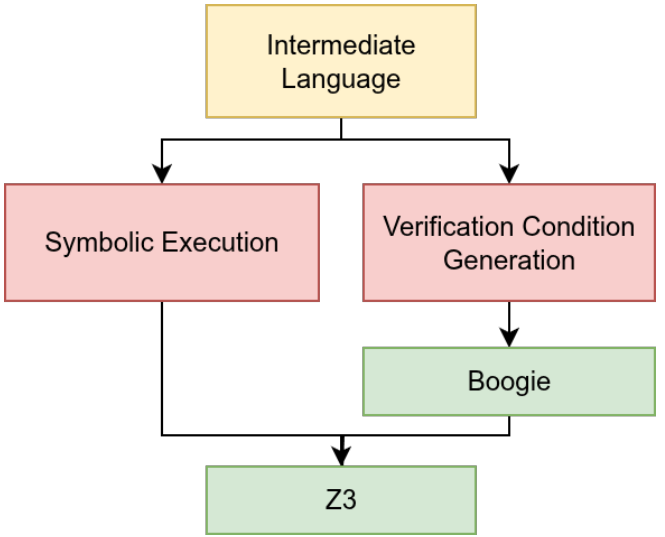


Looking back:

What were our design principles?
What tradeoffs did we make?
How did they work out?
How did Viper evolve?

Architecture: Multiple backends

Unique feature for IVLs: **Multiple backends**



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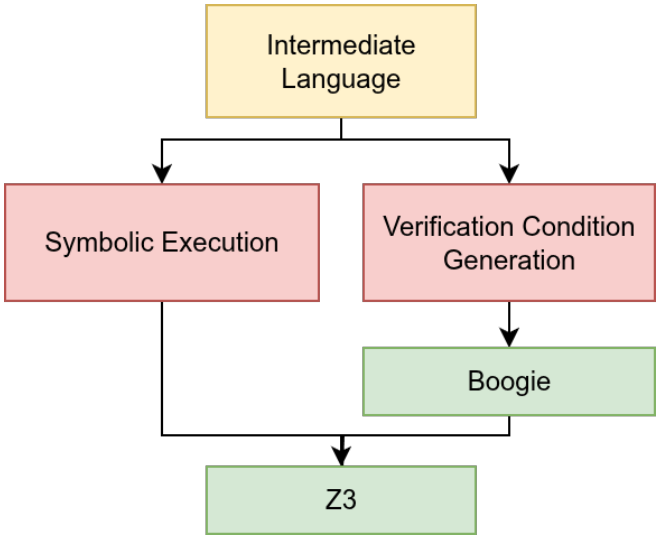
- Supporting same language, logic
- Goal: transparent to users



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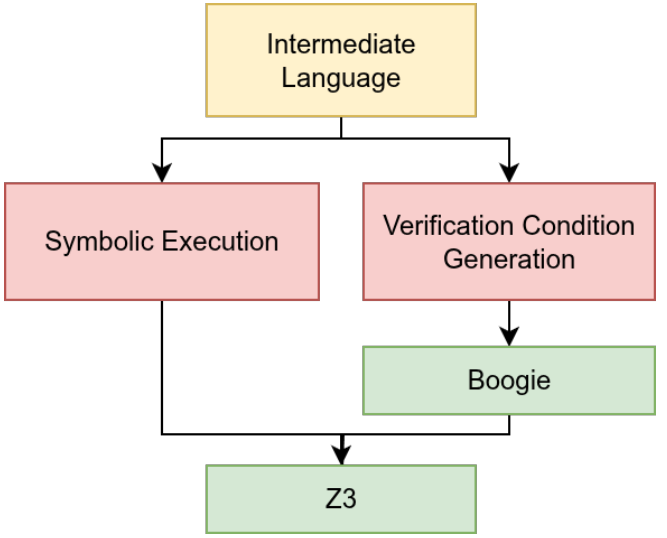
- Different performance/completeness characteristics
  - **Crucial** to enable several important case studies
  - Going further: **Multiple algorithms** per backend (CAV 2024)
- Differential testing



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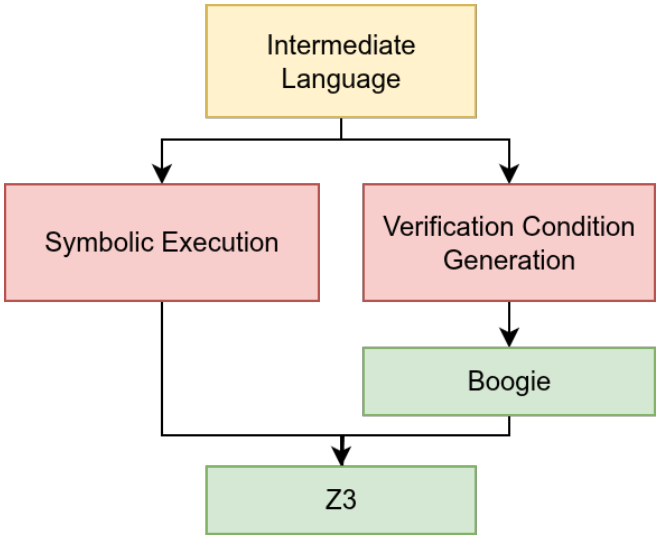
Cons:

- Maintenance effort
  - Especially problematic for a research group



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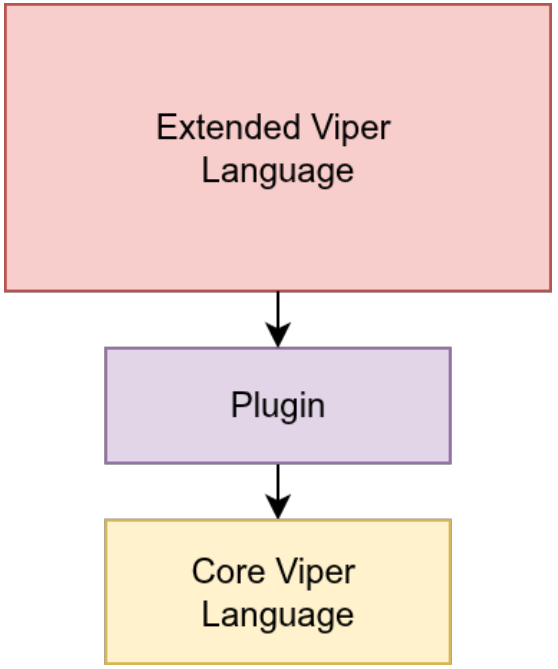

Other Topics in the Paper

- Language design:
  - Error reporting
  - Human-readability
- Logic:
  - Degree of automation
  - Formalization
  - Choice of a non-standard logic

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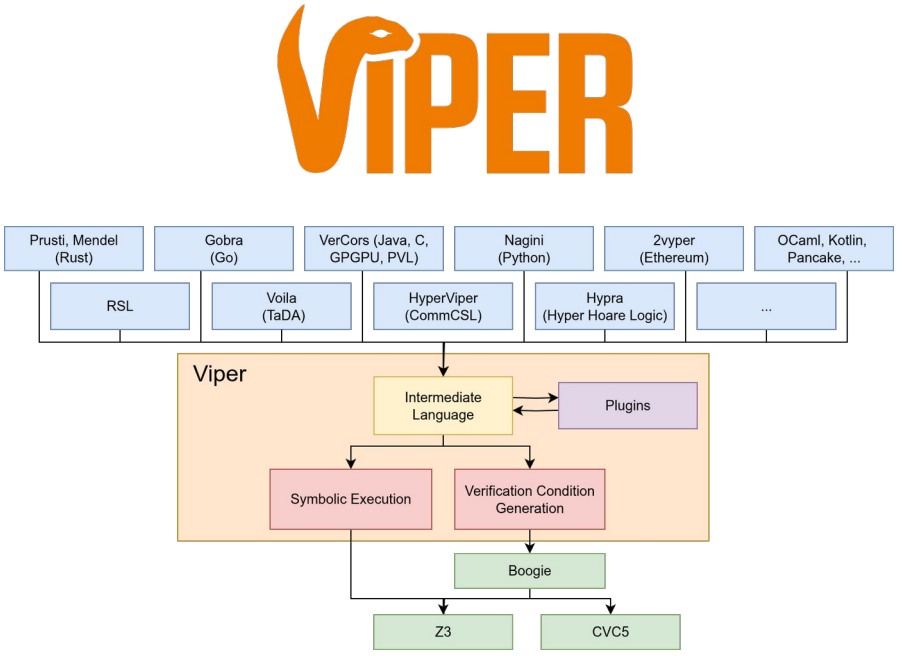

viper.ethz.ch