Compilers

Pluggable Type Checkers

Salahaddin University
College of Engineering
Software Engineering Department
2011-2012

Amanj Sherwany
http://www.amanj.me/wiki/doku.php?id=teaching:su:compilers

Type Systems

- Traditionally, statically typed programming languages incorporate a built-in static type system.
- This system is typically mandatory:
  - Every legal program must successfully typecheck according to the rules of the type system.
- Mainstream programming languages incorporate mandatory type systems, like Java, C and C++.

Type Systems, *Cont'd*

- These type systems are widely perceived to enhance software reliability and security, by mechanically proving program properties.
- Paradoxically, such mandatory type systems inhibit software reliability and security, because they contribute to system complexity and brittleness.

Type Systems, *Cont'd*

- The advantages of mandatory typing are widely recognized:
  - Types provide a form of machine-checkable documentations.
  - Types provide a conceptual framework for the programmer, that is extremely useful for program design, maintenance and understanding.
  - Types support early error detection.
  - Languages with mandatory types can be optimized based on type information, yielding significant performance advantage.

Type Systems, *Cont'd*

- Mandatory type systems constrain the expressiveness of the language.
- Mandatory type systems greatly reduce the number of legal programs that can be expressed in a language.

Pluggable Type Checkers

- Or, optional type systems
- First proposed by Bracha
- Allow static checking of different program properties at different stages.
- In Bracha's terms:
  - Have no effect on the run-time semantics of the programming language.
  - Do not mandate type annotations in the syntax.

Demo

DEMO

How Pluggable Type Checkers Work

```
import checkers.nullness.quals.*;
public class Test{
    void print(@NonNull String str){
        System.out.println(str);
    }
}
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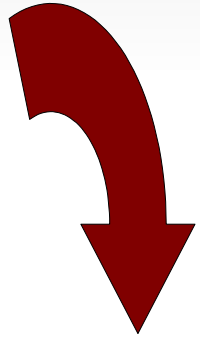
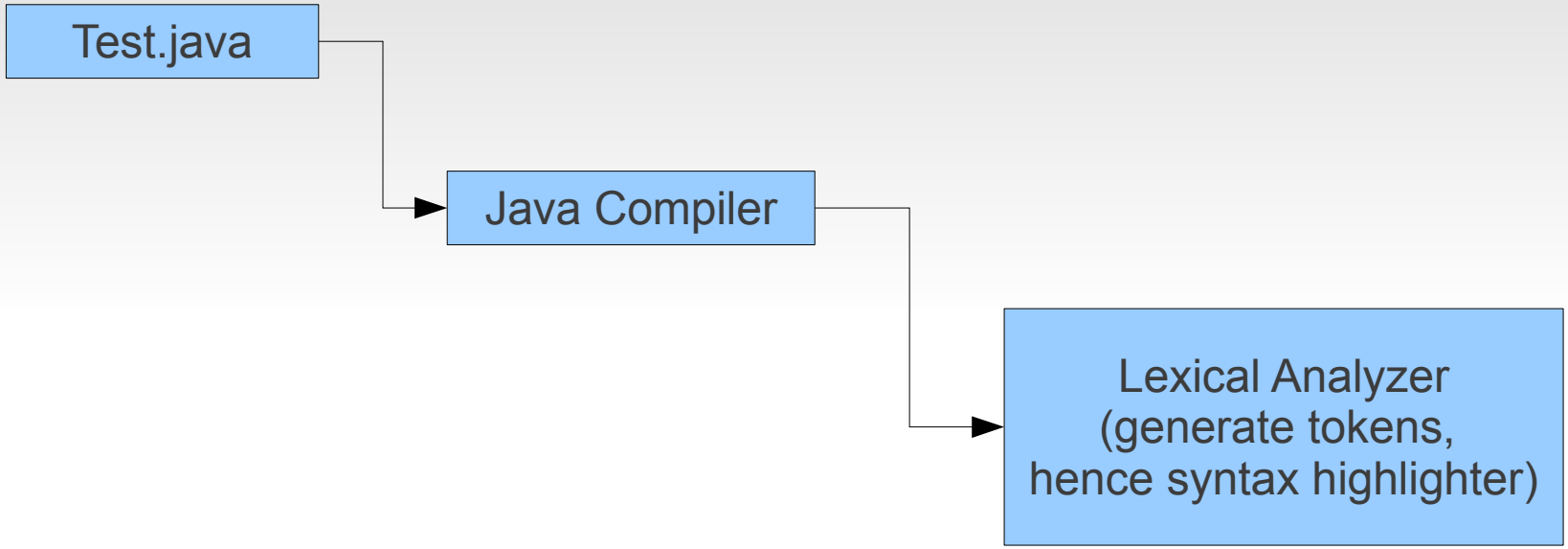


Compile it

```
javac -processor checkers.nullness.NullnessChecker Test.java
```

How Pluggable Type Checkers Work



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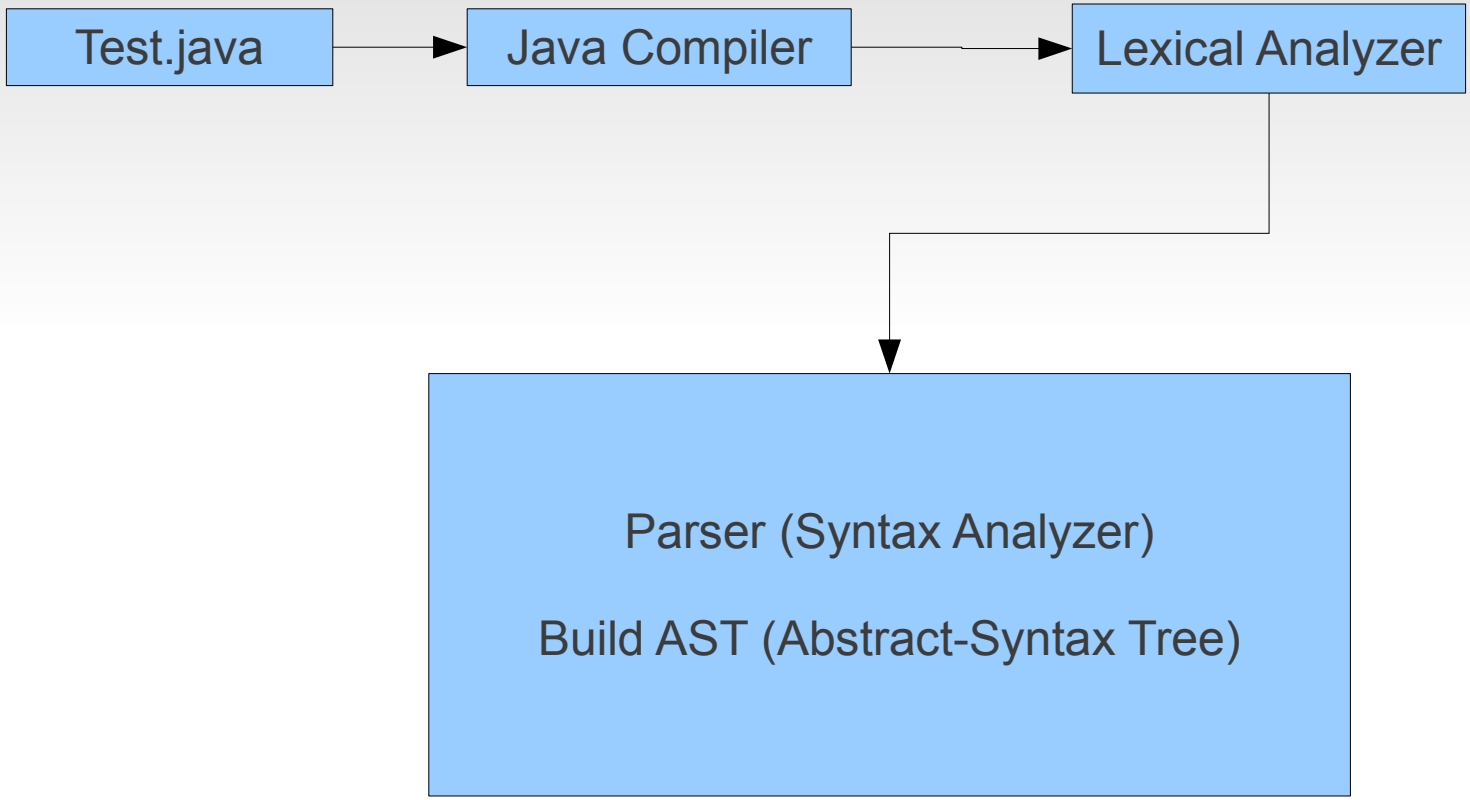

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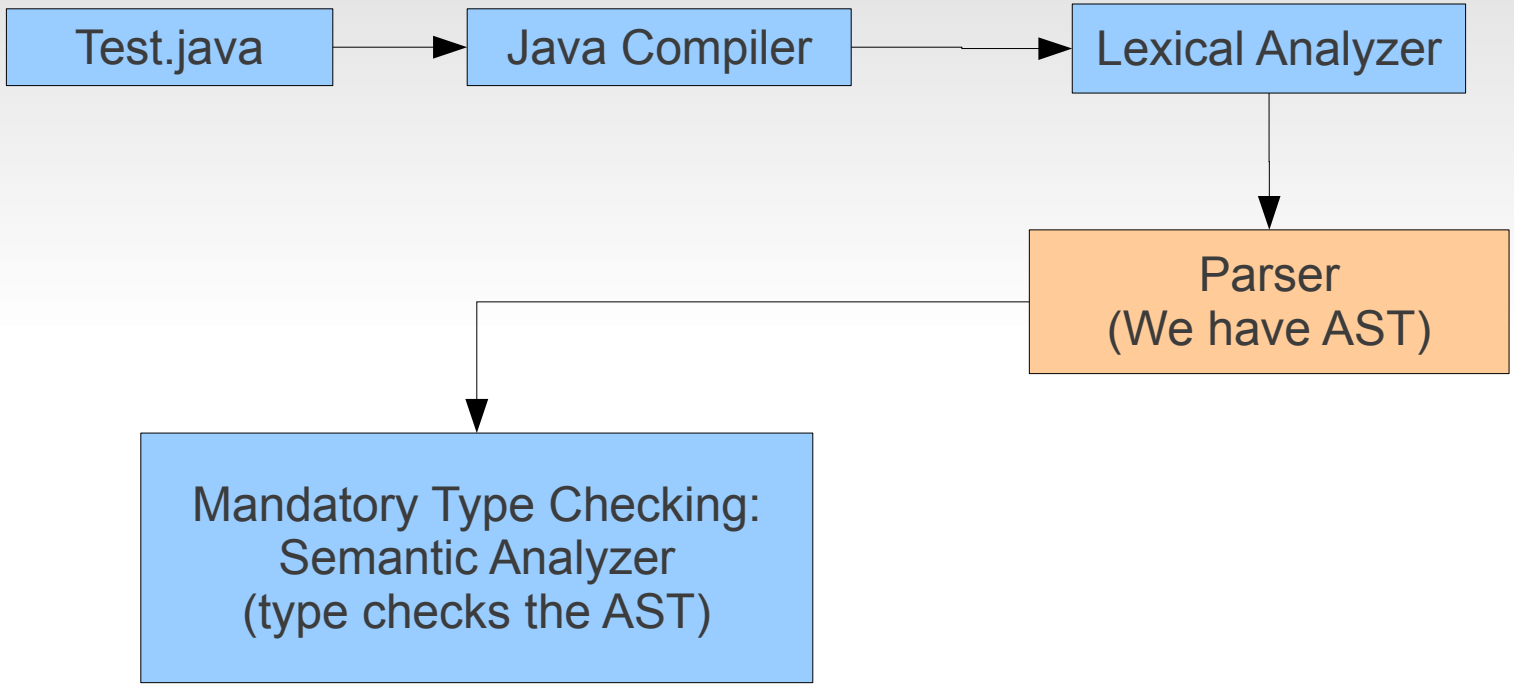

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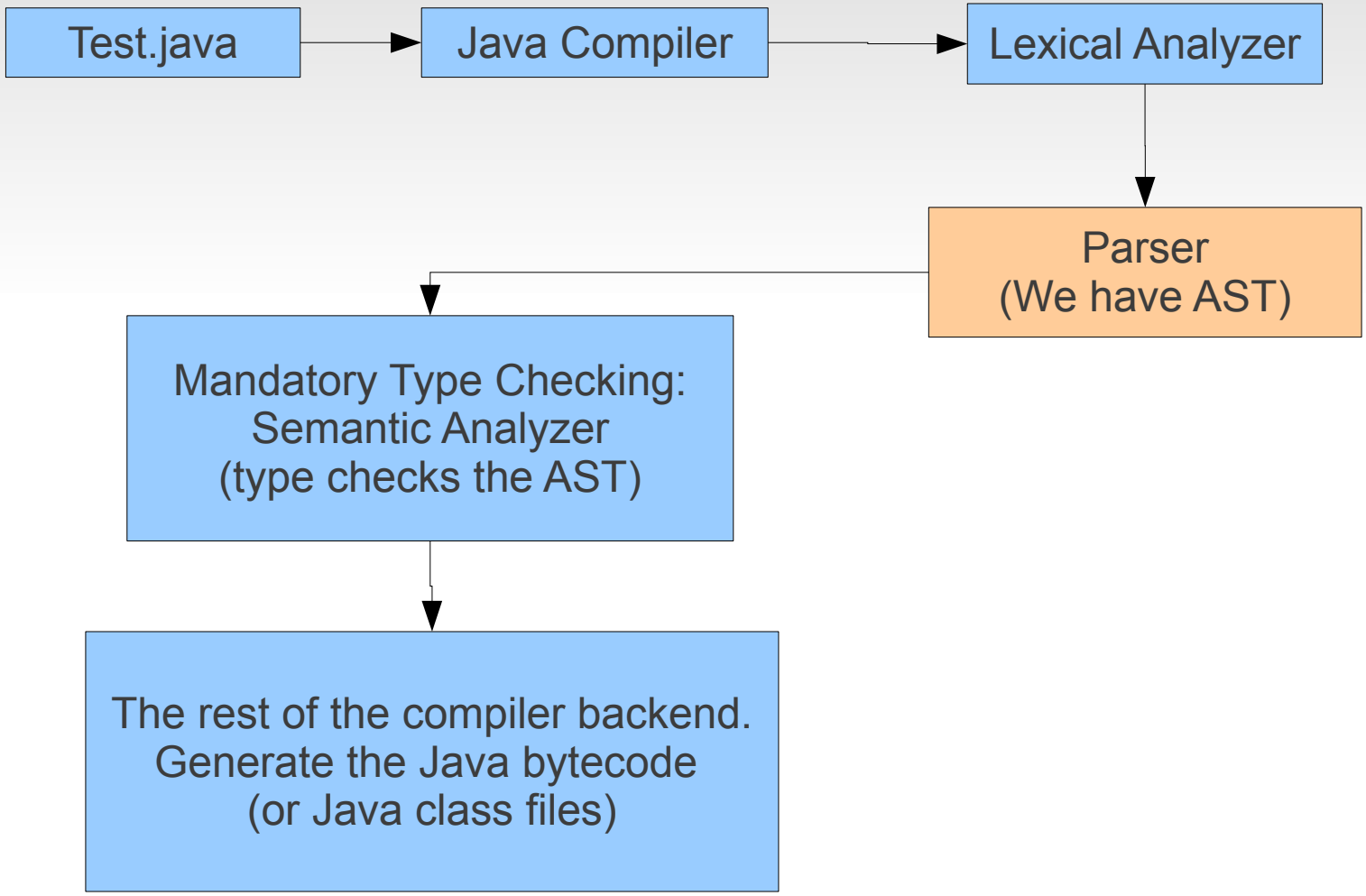

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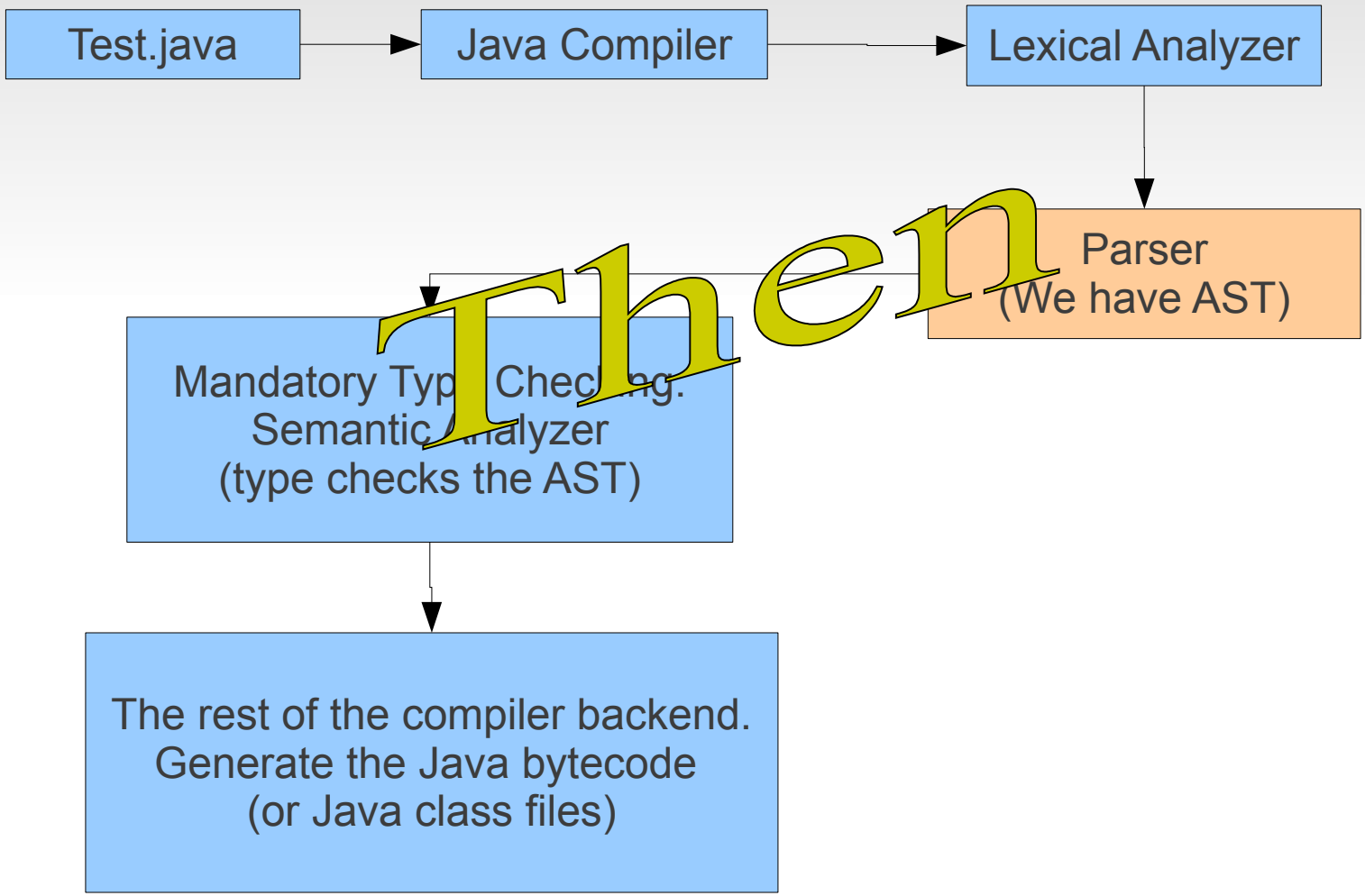

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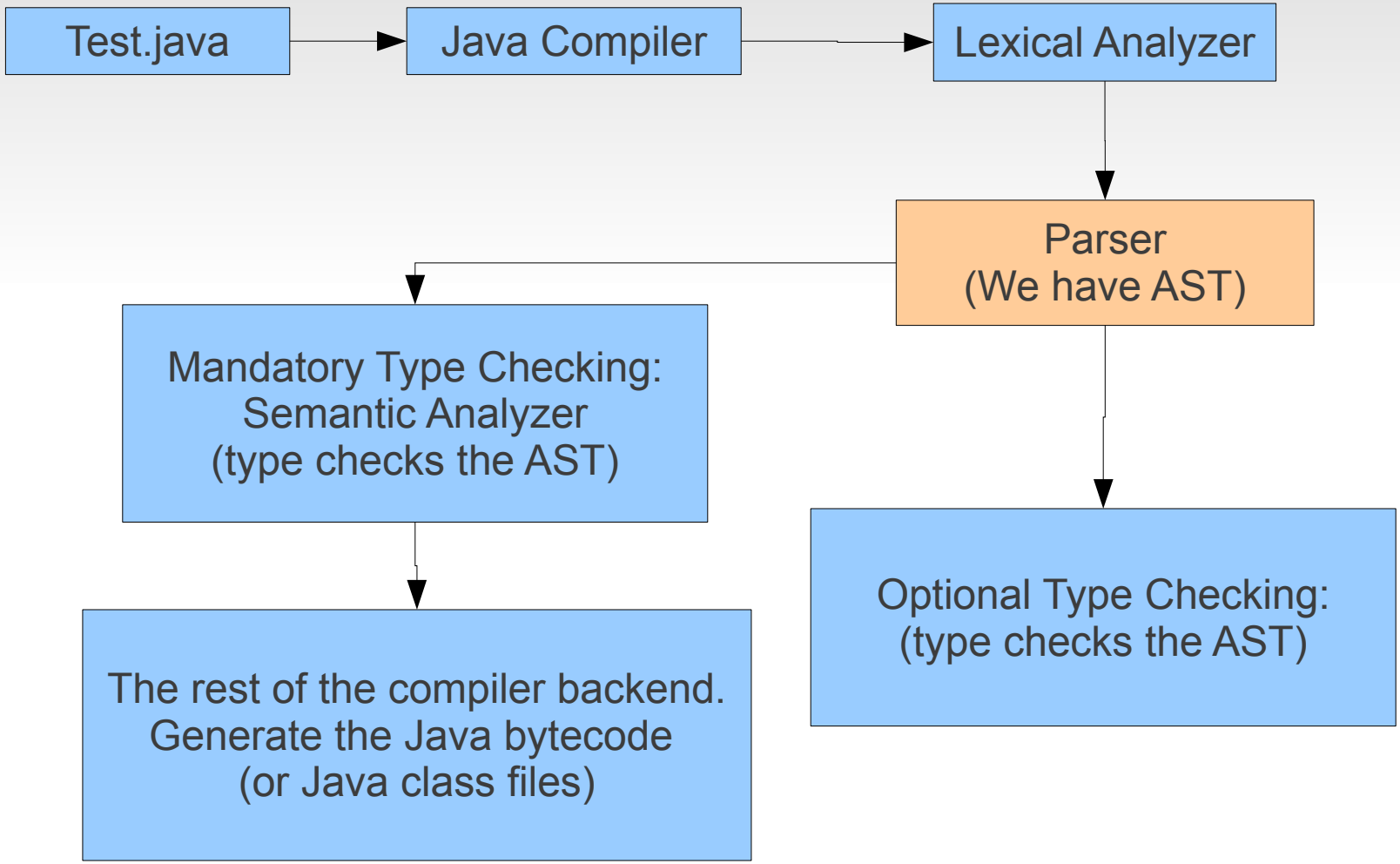

Questions?

Thank You