D lang
Syntax Analyzer

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Compiler Construction
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Project Context

Dynamic Lang

object types are not specified and can change while program execution

the language assumes **interpretation**

C++ Language

the implementation language is C++

it provides extensive memory management and optimization features

Personal parser

hand-written parser

if you want a thing done well, do it yourself :)

Recall: Lexer

```
var x := 5
print x
```

```
tkVar tkIdent(”x”) tkAssign tkIntLiteral(5) tkNewLine
tkPrint tkIdent tkNewLine
```

```
var t := {x:=1}
t := t + {y:=2}
```

```
tkVar tkIdent(t) tkAssign tkOpenCurlyBrace tkIdent(“x”)
tkAssign tkIntLiteral(1) tkClosedCurlyBrace tkNewLine
tkIdent(“t”) tkAssign tkIdent(“t”) tkPlus tkOpenCurlyBrace
tkIdent(“y”) tkAssign tkIntLiteral(2) tkClosedCurlyBrace
```

```
var x := 3
if x < 10 then
    print "small"
else
    print "big"
end
```

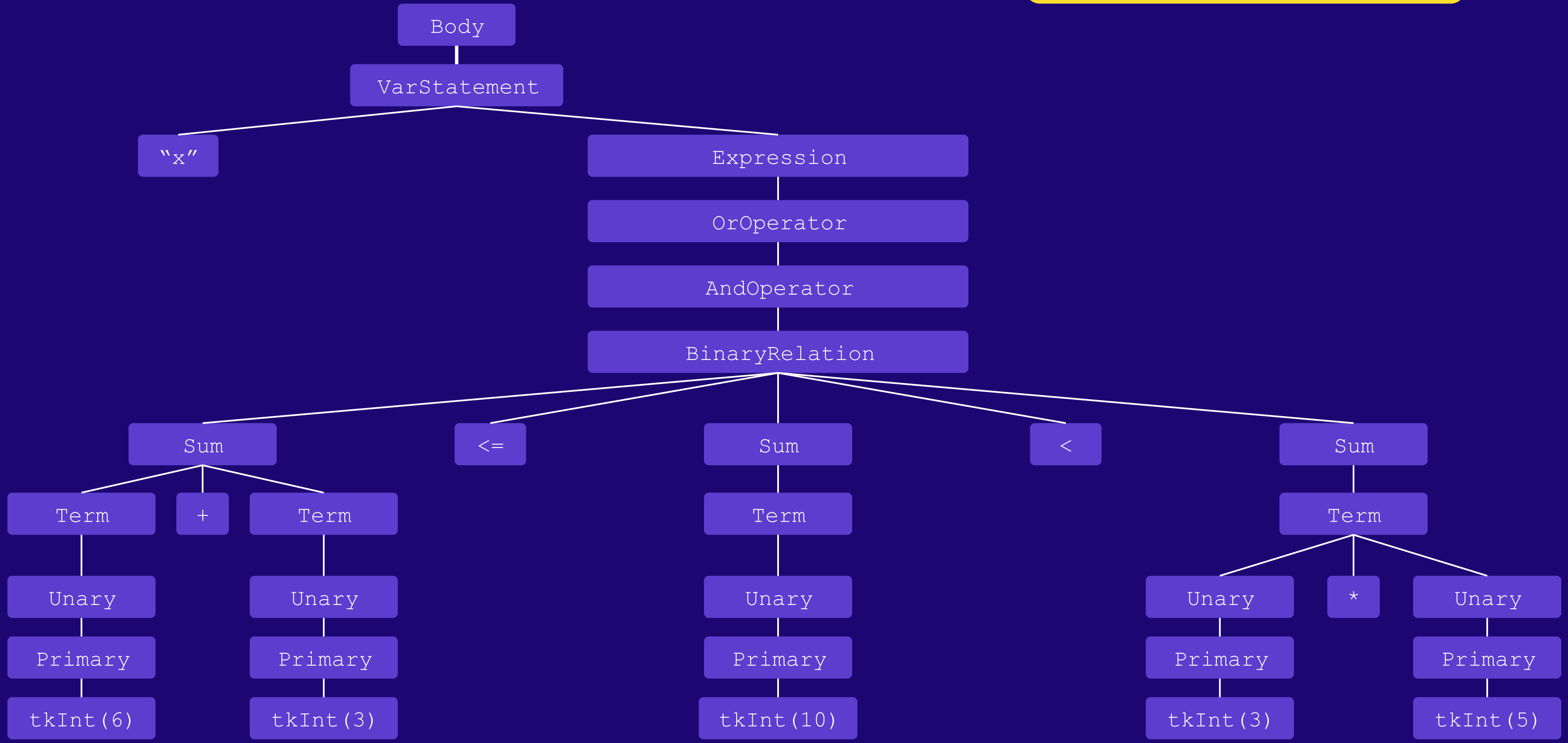
```
tkVar tkIdent(“x”) tkAssign tkIntLiteral(3) tkNewLine tkIf
tkIdent(“x”) tkLess tkIntLiteral(10) tkThen tkNewLine
tkPrint tkStringLiteral(“small”) tkNewLine tkElse tkNewLine
tkPrint tkStringLiteral(“big”) tkNewLine tkEnd tkNewLine
```

Syntax Analyzer: Output

```
var x := 6 + 3 <= 10 < 3 * 5
```

Syntax Analyzer: Output

```
var x := 6 + 3 <= 10 < 3 * 5
```

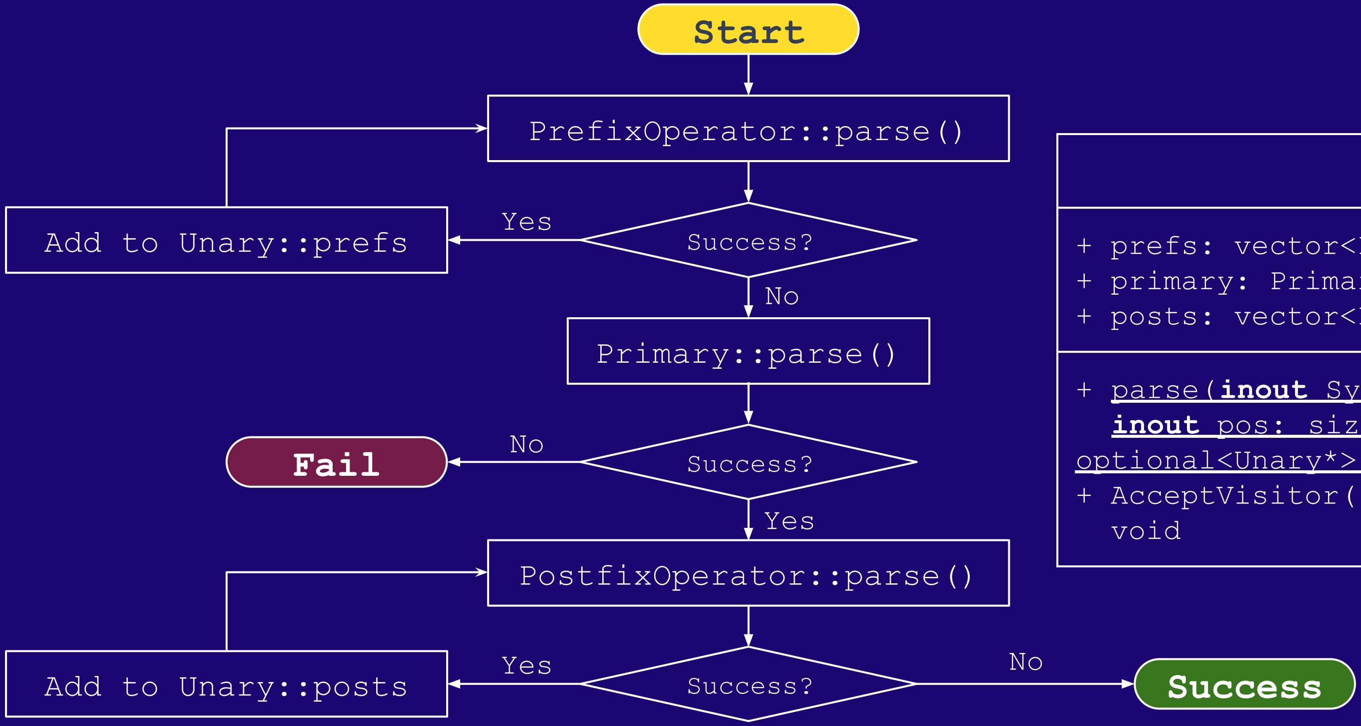


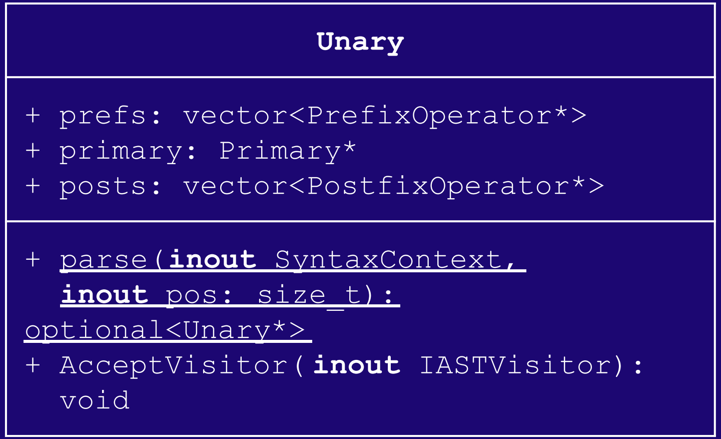
Syntax Analyzer: Implementation

- We have a class for every syntactic structure
- Every class has a *static* method `parse(SyntaxContext&, size_t& pos)`
- On **success**, `parse` returns the parsed syntax node *and* advances the token pointer
- On **failure**, `parse` returns nothing and logs a diagnostic message
- One class's `parse` may invoke other classes' `parse` for *nested structures*
- `parseProgram(...)` is the top method that parses the whole file through other `parse`s

Syntax Analyzer: Implementation (example)

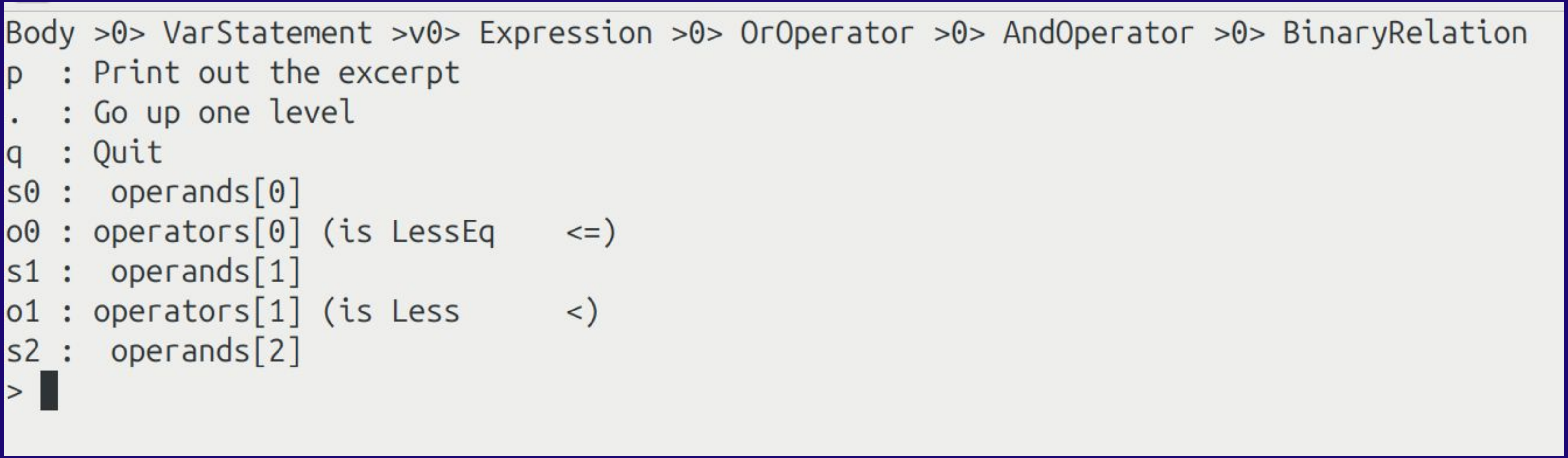
Unary -> {PrefixOperator} Primary {PostfixOperator}





Unary
+ prefs: vector<PrefixOperator*> + primary: Primary* + posts: vector<PostfixOperator*>
+ parse(**inout** SyntaxContext, **inout** pos: size_t): optional<Unary*> + AcceptVisitor(**inout** IASTVisitor): void

Syntax Analyzer: CLI



```
Body >0> VarStatement >v0> Expression >0> OrOperator >0> AndOperator >0> BinaryRelation
p  : Print out the excerpt
.  : Go up one level
q  : Quit
s0 :  operands[0]
o0 : operators[0] (is LessEq    <=)
s1 :  operands[1]
o1 : operators[1] (is Less      <)
s2 :  operands[2]
> 
```