免费电子书

学习

ANTLR

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#antlr

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1: ANTLR

ANTLR。 。 ANTLR。

- antlr

Antlr
Antlr。 antlrV1.V2.V3

- V1V1
- V2V2
- V3

AntlrJava。 antlr。

- Java
- C
- Python23
- JavaScript

2.0	1997-05-01
3.0	2011-01-19
4	2013121
4.1	2013-07-01
4.2	2014-02-05
4.2.1	2014325
4.2.2	201447
4.3	2014-06-19
4.4	2014716
4.5	2015123
4.5.1	2016716
4.5.2	2016130

4.5.3	2016331
4.6	○
4.7	2017330

Examples

hello world

```
// define a grammar called Hello
grammar Hello;
r   : 'hello' ID;
ID  : [a-z]+ ;
WS  : [ \t\r\n]+ -> skip ;
```

.g4/

```
Java -jar antlr-4.5.3-complete.jar Hello.g4

//OR if you have setup an alias or use the recommended batch file

antlr4 Hello.g4
```

Hello.g4

1. Hello.tokens
2. HelloBaseListener.java
3. HelloLexer.java
4. HelloLexer.tokens
5. HelloListener.java
6. HelloParser.java

ANTLR jar。Java

```
javac *.java
```

ANTLR https://riptutorial.com/zh-CN/antlr/topic/4453/antlr

2: ANTLR v3

Examples

EclipseANTLR

IndigoANTLR IDE 2.1.2

1. Eclipse。
2. ANTLR v2ANTLRjar。 。 antlr-nnEclipse。
3. ANTLR IDEEclipse。
    - Eclipse“”“”。
    - ...。
    - Add RepositoryLocationhttp://antlrv3ide.sourceforge.net/updatesANTLR IDEOK Available Software。
    - ANTLR IDE vn.nn。 Eclipse。
4. ANTLR IDE。
    - EclipseWindowPreferences。
    - ANTLRBuilder。
    - “...”。
    - Add ANTLR PackageDirectory ...antlr-nnOK。
    - “”“ANTLR”。
    - Code GeneratorProject relative。 。 antlr-javaantlr。
    - “”“”-nfa-dfa。 ANTLRjava。
    - “”“”。
5. JavaANTLR。
    - EclipseFileNewJava Project。 NextFinish。
    - ANTLRPackage ExplorerConfigureConvert to ANTLR project。
    - ANTLRjarPropertiesJava Build PathAdd External JARs ...ANTLR jarOK。 “”“”。
6. ANTLR。
    - ANTLRsrcFileNewOtherANTLRCombined Grammar。 “”“”“”。
    - “.g”。 language = Java@ header@ ierer :: header@members。 CTRL。
7. 。
    - JavaProject Explorer。 “”“”“ANTLR”-nfa-dfa4g。 [CLASSPATHEclipse3264Java7 Windows PathJava7 SDK。
    - “”JavaJava“”“”。

```
grammar test; //must match filename.g

options {
    language = Java;
}
```

```
@header { //parser
    package pkgName; //optional
    import java.<whatever you need>.*;
}

@members { //parser
    // java code here
}

@lexer::header { //lexer
    package pkgName; //optional
    import java.<whatever you need>.*;
}

@lexer::members {
    // java code here
}
/*------------------------------------------------------------------
 * PARSER RULES (convention is all lowercase)
 *------------------------------------------------------------------*/
parserule: LEXRULE;

/*------------------------------------------------------------------
 * LEXER RULES (convention is all uppercase)
 *------------------------------------------------------------------*/
LEXRULE: 'a'..'z';
```

ANTLR v3 https://riptutorial.com/zh-CN/antlr/topic/6629/antlr-v3

3: ANTLR v4

ANTLR v4/。 ANTLRAST。 。 ANTLR v4JavaCJavaScriptPython2Python3。C ++。GUI IDE Visual StudioIntellijNetBeansEclipse。

ANTLR 。 ANTLRTerrence ParrANTLR The Definitive ANTLR 4 Reference。

- 4.501/22/15 - JavaScriptC。 4.5
- 4.407/16/14 - Python2Python3。 4.4
- 4.306/18/14 - ;。 4.3
- 4.202/04/14 - /。 4.2
- 4.106/30/13 - ;ASTPNG。 4.1
- 4.001/21/13 - 。

Examples

ANTLRJava Jar。ANTLRjarJava。

ANTLR JARANTLRJAR

```
Java -jar antlr-4.5.3-complete.jar
```

antlr-4.5.3-complete.jar。

```
ANTLR Parser Generator  Version 4.5.3
 -o ___              specify output directory where all output is generated
 -lib ___            specify location of grammars, tokens files
 -atn                generate rule augmented transition network diagrams
 -encoding ___       specify grammar file encoding; e.g., euc-jp
 -message-format ___ specify output style for messages in antlr, gnu, vs2005
 -long-messages      show exception details when available for errors and warnings
 -listener           generate parse tree listener (default)
 -no-listener        don't generate parse tree listener
 -visitor            generate parse tree visitor
 -no-visitor         don't generate parse tree visitor (default)
 -package ___        specify a package/namespace for the generated code
 -depend             generate file dependencies
 -D<option>=value    set/override a grammar-level option
 -Werror             treat warnings as errors
 -XdbgST             launch StringTemplate visualizer on generated code
 -XdbgSTWait         wait for STViz to close before continuing
 -Xforce-atn         use the ATN simulator for all predictions
 -Xlog               dump lots of logging info to antlr-timestamp.log
```

```
     1. Add antlr4-complete.jar to CLASSPATH, either: Permanently:
Using System Properties dialog > Environment variables > Create or append to CLASSPATH
variable Temporarily, at command line: SET CLASSPATH=.;C:\Javalib\antlr4-
complete.jar;%CLASSPATH%
     3.Create batch commands for ANTLR Tool, TestRig in dir in PATH
```

```
antlr4.bat: java org.antlr.v4.Tool %*
grun.bat:   java org.antlr.v4.gui.TestRig %*
```

.g4

```
Java -jar antlr-4.5.3-complete.jar yourGrammar.g4
```

-Dlanguage。C

```
java -jar antlr-4.5.3-complete.jar yourGrammar.g4 -Dlanguage=CSharp
```

。

Build Automation

ANTLR。

MavenGradle `org.antlr:antlr4-runtime` 。

- - mavenMaven `org.antlr:antlr4` 。

EclipseHello World

ANTLR 4.5.3Eclipse NeonANTLR 4 IDE 0.3.5Java 1.8

1. ANTLR 。 ANTLR Javajar。 Java。 。
2. EclipseANTLR IDE。
    - Eclipse“”“Eclipse Marketplace”。
    - “”antlr“”。
    - “ANTLR 4 IDE”。
    - Confirm Selected FeaturesFinish。
    - “”“”。
    - Eclipse。
3. “...”。
    - EclipseANTLR 4HOMEcom.github.jknack.antlr-4ide.Antlr4com.github.jknack.antlr-4ide.Antlr4。 。
    - HOME。 。
    - Xtext 2.7.3antlr-nnn-complete.jar。
    - Eclipse“”“”。
    - “...”“”。
    - xtext 2.7.3Archive ...Xtext 2.7.3OK。
    - “”“”“”>。 。

- Eclipse。

4. Eclipse / Java ANTLR。

    - EclipseWindowPreferences。
    - JavaBuild PathClasspath Variables。
    - New ...NameFile ...antlr-nnn-complete.jar。“”“”。
    - 。

5. ANTLR IDE。

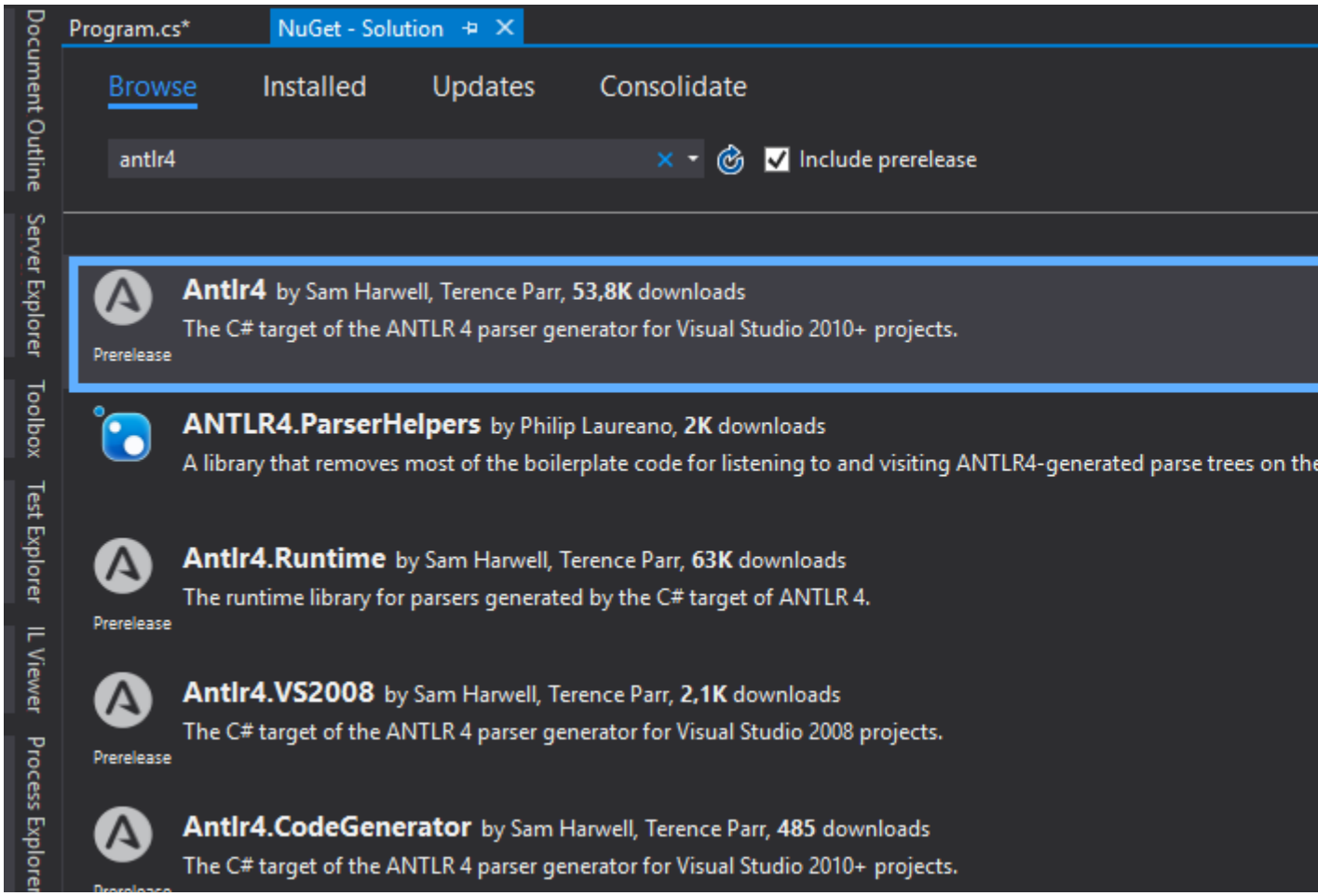
    - EclipseWindowPreferences。
    - ANTLR 4Tool。
    - “”。 java./antlr-java。
    - “”“”。

6. ANTLR 4。

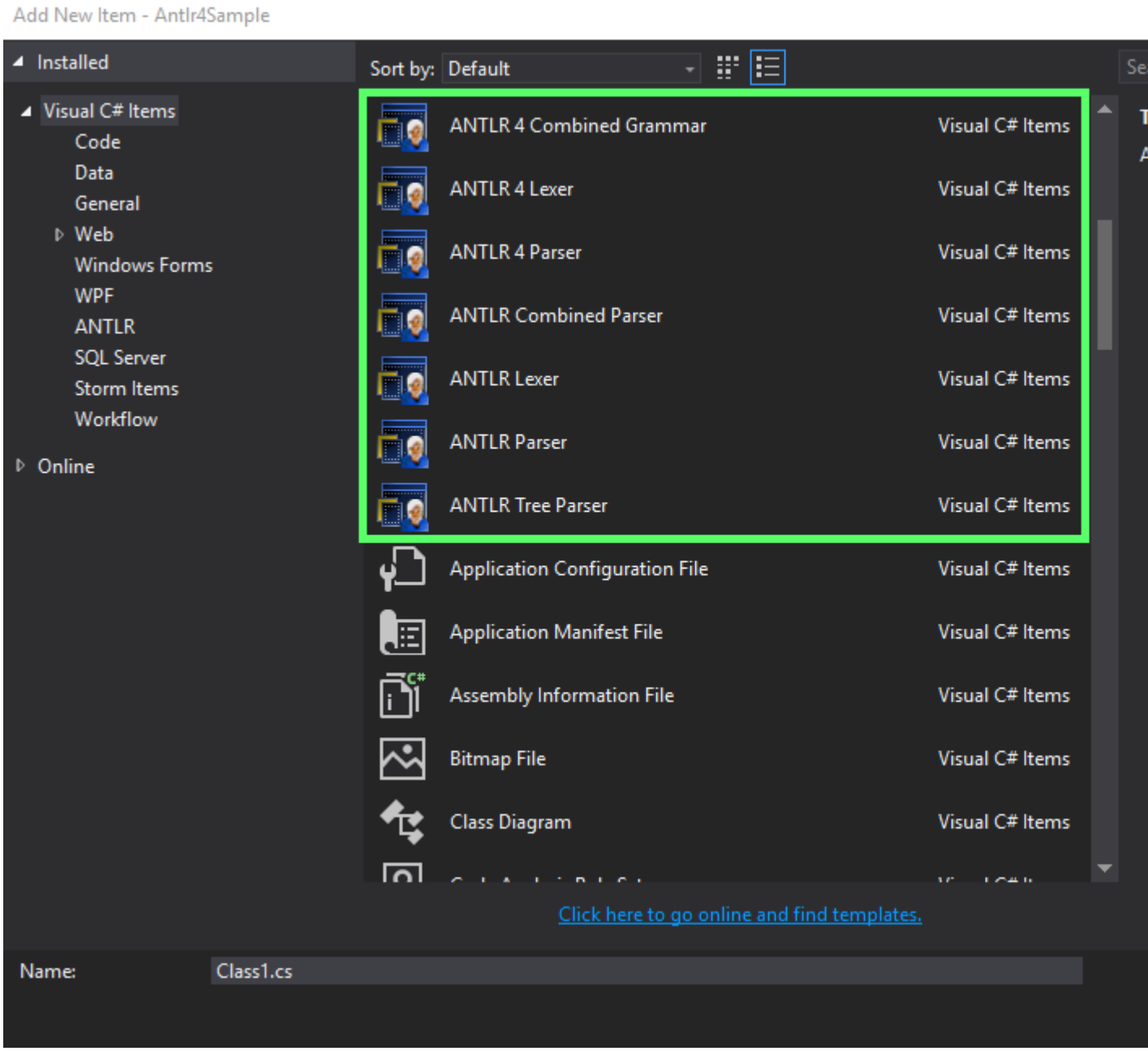
    - EclipseFileNewProject。
    - New ProjectGeneralANTLR 4 Project。
    - NextFinish。
    - Hello.g4“Hello World”。
    - g4target5。

Visual Studio 2015ANTLRNuget

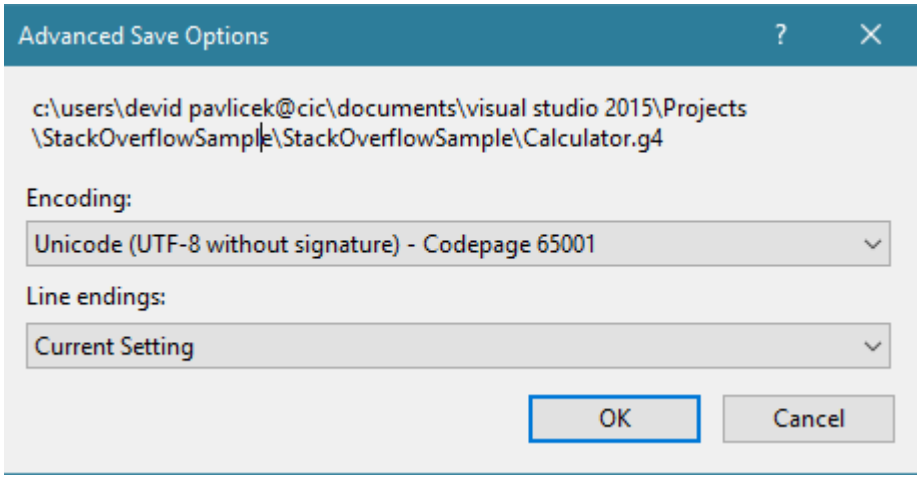
1. Visual Studio 2015→→Antlr。 ANTLRSam HarwellVisual Studio。
2. 。 Solution→Manage Nuget Packages for Solution→BrowseTabAntlr4。


Document Outline
Server Explorer
Toolbox
Test Explorer
IL Viewer
Process Explorer
Program.cs*
NuGet - Solution
Browse
Installed
Updates
Consolidate
antlr4
Include prerelease
Antlr4 by Sam Harwell, Terence Parr, 53,8K downloads
The C# target of the ANTLR 4 parser generator for Visual Studio 2010+ projects.
Prerelease
ANTLR4.ParserHelpers by Philip Laureano, 2K downloads
A library that removes most of the boilerplate code for listening to and visiting ANTLR4-generated parse trees on the
Antlr4.Runtime by Sam Harwell, Terence Parr, 63K downloads
The runtime library for parsers generated by the C# target of ANTLR 4.
Prerelease
Antlr4.VS2008 by Sam Harwell, Terence Parr, 2,1K downloads
The C# target of the ANTLR 4 parser generator for Visual Studio 2008 projects.
Prerelease
Antlr4.CodeGenerator by Sam Harwell, Terence Parr, 485 downloads
The C# target of the ANTLR 4 parser generator for Visual Studio 2010+ projects.

3. ◦ ANTLR4◦

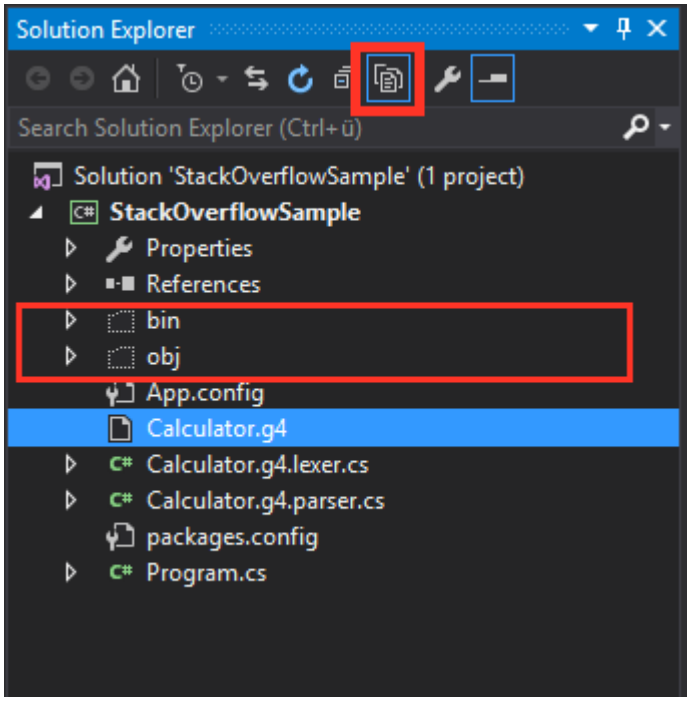


4. ANTLR.g4→Unicode UTF-8 - 65001。。

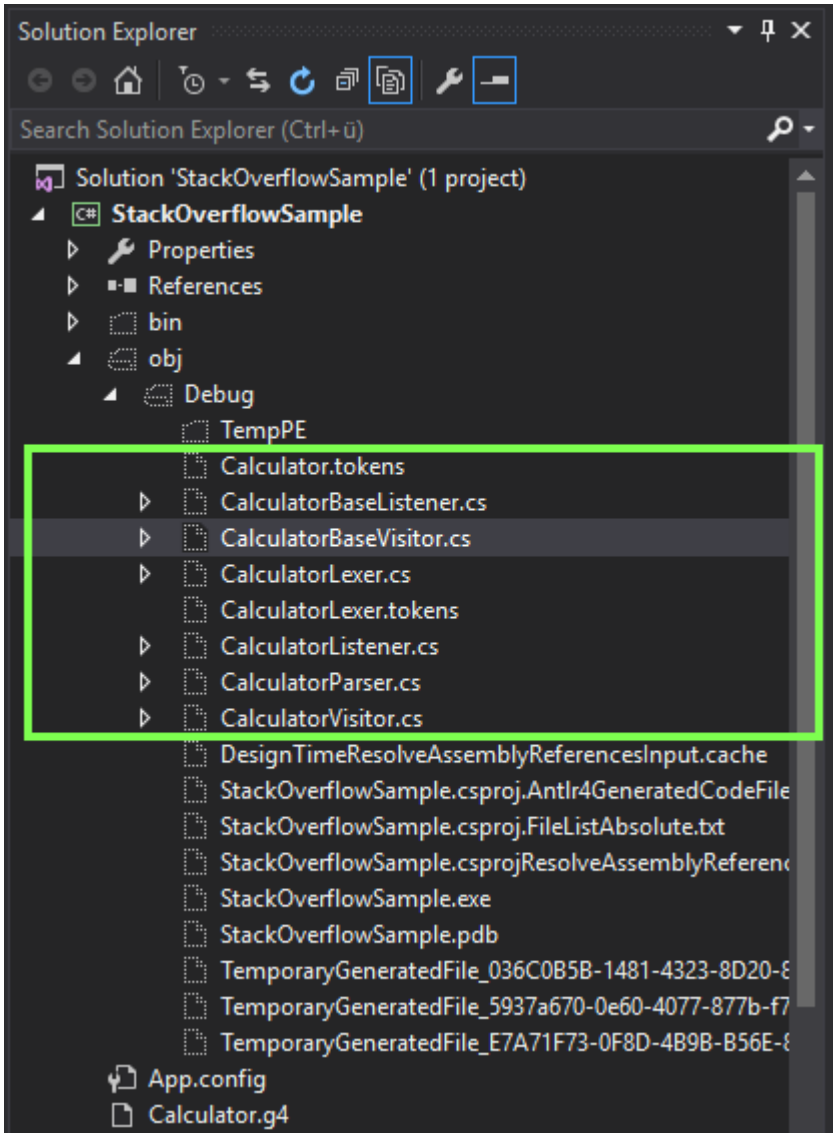


- ANTLR 4 Combined GrammarCalculator.g4
- Github Tom Everett
-
-

Solution Explorer→“”。



-
- objSolution ExplorercsVisitorListener。。Visual Studio 2015ANTLR。



ANTLR v4 https://riptutorial.com/zh-CN/antlr/topic/2856/antlr-v4

4: ANTLR/

Examples

ANTLR

1. C
2. Python
3. JavaScript
4. Java

ANTLRJava

```
Java -jar antlr-4.5.3-complete.jar yourGrammar.g4 //Will output a
    java parser
```

OS/

```
    antlr4 -Dlanguage=Python3 yourGrammar.g4
//with alias
    java -jar antlr-4.5.3-complete.jar -Dlanguage=Python3 yourGrammar.g4
//without alias
```

/'-Dlanguage'.g4

```
options {
    language  = "CSharp";
}
//or
options {
    language="Python";
}
```

ANTLR

1. CSharp
2. Python 2
3. python 3

ANTLR

Python

ANTLR.jar.g4

```
1.yourGrammarNameListener.py
2.yourGrammarNameParser.py
3.yourGrammarName.tokens
...
```

pythonPythonANTLR。 IDE。

```
#main.py
import yourGrammarNameParser
import sys

#main method and entry point of application

def main(argv):
    """Main method calling a single debugger for an input script"""
    parser = yourGrammarNameParser
    parser.parse(argv)

if __name__ == '__main__':
    main(sys.argv)
```

。

```
#yourGrammarNameParser.py
from yourGrammarNameLexer import yourGrammarNameLexer
from yourGrammarNameListener import yourGrammarNameListener
from yourGrammarNameParser import yourGrammarNameParser
from antlr4 import *
import sys

class yourGrammarNameParser(object):
    """
    Debugger class - accepts a single input script and processes
    all subsequent requirements
    """
def __init__(self): # this method creates the class object.
    pass


#function used to parse an input file
def parse(argv):
    if len(sys.argv) > 1:
        input = FileStream(argv[1]) #read the first argument as a filestream
        lexer = yourGrammarNameLexer(input) #call your lexer
        stream = CommonTokenStream(lexer)
        parser = yourGrammarNameParser(stream)
        tree = parser.program() #start from the parser rule, however should be changed to your
entry rule for your specific grammar.
        printer = yourGrammarNameListener(tree,input)
        walker = ParseTreeWalker()
        walker.walk(printer, tree)
    else:
        print('Error : Expected a valid file')
```

ANTLR。

。

ANTLR/ https://riptutorial.com/zh-CN/antlr/topic/3414/antlr-

5: Lexer4

Examples

Lexer。 。

```
INTEGER: [0-9]+;
IDENTIFIER: [a-zA-Z_] [a-zA-Z_0-9]*;

OPEN_PAREN: '(';
CLOSE_PAREN: ')';
```

A	A
AB	AB
(A|B)	AB
'text'	“”
A?	A
A*	A
A+	A
[A-Z0-9]	AZ0-9
'a'..'z'	
~[AZ]	-
.	

- 。

```
INTEGER: DIGIT+
       | '0' [Xx] HEX_DIGIT+
       ;

fragment DIGIT: [0-9];
fragment HEX_DIGIT: [0-9A-Fa-f];
```

'{'。

```
OPEN_BRACE: '{';
```

```
parserRule: '{';
parserRule: OPEN_BRACE;
```

OPEN_BRACE ◦ ◦

◦

-
- '{'
-

```
grammar LexerPriorityRulesExample;

// Parser rules

randomParserRule: 'foo'; // Implicitly declared token type

// Lexer rules

BAR: 'bar';
IDENTIFIER: [A-Za-z]+;
BAZ: 'baz';

WS: [ \t\r\n]+ -> skip;
```

```
aaa foo bar baz barz
```

```
IDENTIFIER 'foo' BAR IDENTIFIER IDENTIFIER
```

- aaaIDENTIFIER

  IDENTIFIER◦

- foo'foo'

  randomParserRule'foo'IDENTIFIER◦

- barBAR

  BARIDENTIFIER◦

- bazIDENTIFIER

  BAZIDENTIFIER◦ BAR ◦

  BAZ IDENTIFIERBAZ◦

- barzIDENTIFIER

  BAR3 bar IDENTIFIER4◦ IDENTIFIERBAR ◦

◦ ◦

'foo' ◦

Lexer

```
WHITESPACE: [ \r\n] -> skip;
```

`->`。

- `skip`
- `channel(n)`
- `type(n)`
- `mode(n)` `pushMode(n)` `popMode` `more`

`{` ... `}`

```
IDENTIFIER: [A-Z]+ { log("matched rule"); };
```

`{` ... `}?}?` 。 false。

```
IDENTIFIER: [A-Z]+ { identifierIsValid() }?;
```

。

Lexer4 https://riptutorial.com/zh-CN/antlr/topic/3271/lexer4

6: TestRig / grun

Examples

TestRig

ANTLR。

ANTLR jarANTLR

```
export CLASSPATH=".:/usr/local/lib/antlr-4.5.3-complete.jar:$CLASSPATH"
```

Dotjava。

AlisesLinux / MAC / Unix

```
alias antlr4='java -jar /usr/local/lib/antlr-4.5.3-complete.jar'
//or any directory where your jar is located
```

。

TestRig

TestRig

```
alias grun='java org.antlr.v4.runtime.misc.TestRig'
```

WindowsANTLR jarTestRig

```
java -cp .;antlr.4.5.3-complete.jar org.antlr.v4.runtime.misc.TestRig
//or
java -cp .;antlr.4.5.3-complete.jar org.antlr.v4.gui.TestRig
```

TestRig

```
grun yourGrammar yourRule -tree //using the setup alias
java -cp .;antlr.4.5.3-complete.jar org.antlr.v4.gui.TestRig yourGrammar YourRule -tree //on
windows with no alias
java -cp .;antlr.4.5.3-complete.jar org.antlr.v4.gui.TestRig yourGrammar Hello r -tree
//Windows with the grammar Hello.g4 starting from the rule 'r'.
```

Visual Parse Tree

ANTLR`-gui`。

JSON.g4

```
/** Taken from "The Definitive ANTLR 4 Reference" by Terence Parr */

// Derived from http://json.org
grammar JSON;

json
   : value
   ;

object
   : '{' pair (',' pair)* '}'
   | '{' '}'
   ;

pair
   : STRING ':' value
   ;

array
   : '[' value (',' value)* ']'
   | '[' ']'
   ;

value
   : STRING
   | NUMBER
   | object
   | array
   | 'true'
   | 'false'
   | 'null'
   ;


STRING
   : '"' (ESC | ~ ["\\])* '"'
   ;
fragment ESC
   : '\\' (["\\/bfnrt] | UNICODE)
   ;
fragment UNICODE
   : 'u' HEX HEX HEX HEX
   ;
fragment HEX
   : [0-9a-fA-F]
   ;
NUMBER
   : '-'? INT '.' [0-9] + EXP? | '-'? INT EXP | '-'? INT
   ;
fragment INT
   : '0' | [1-9] [0-9]*
   ;
// no leading zeros
fragment EXP
   : [Ee] [+\-]? INT
   ;
// \- since - means "range" inside [...]
WS
   : [ \t\n\r] + -> skip
   ;
```

JSON

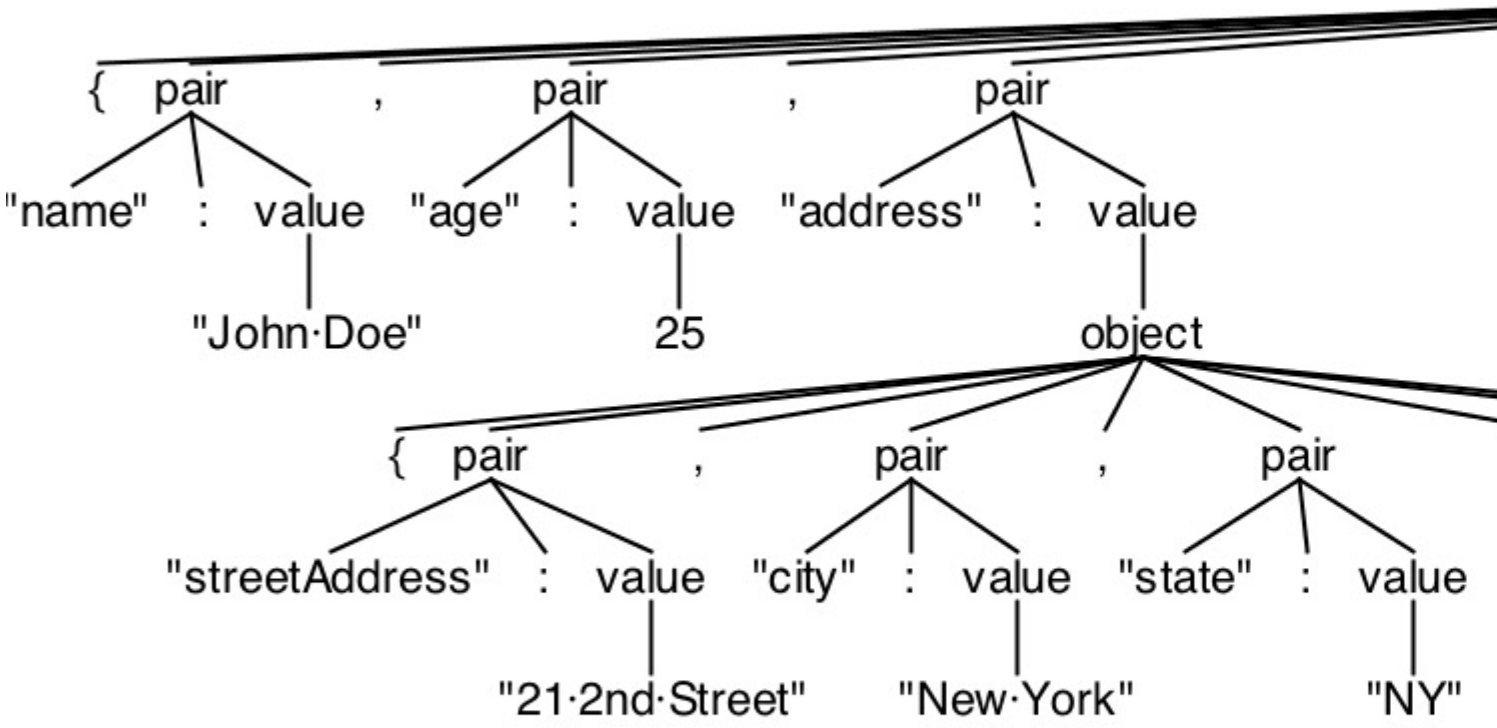
example.json

```
{
  "name": "John Doe",
  "age": 25,
  "address": {
    "streetAddress": "21 2nd Street",
    "city": "New York",
    "state": "NY",
    "postalCode": "10021-3100"
  },
  "phoneNumbers": [
    {
      "type": "home",
      "number": "212 555-1234"
    },
    {
      "type": "mobile",
      "number": "123 456-7890"
    }
  ],
  "children": [],
  "spouse": null
}
```

```
export CLASSPATH=".:/usr/local/lib/antlr-4.0-complete.jar:$CLASSPATH"

alias antlr4='java -jar /usr/local/lib/antlr-4.0-complete.jar'

alias grun='java org.antlr.v4.runtime.misc.TestRig'

antlr4 -o . -lib . -no-listener -no-visitor  JSON.g4; javac *.java; grun JSON json -gui
example.json
```

.java.tokens.class

```
JSON.g4                          JSONLexer.class                JSONListener.java
JSONParser$PairContext.class     JSON.tokens                    JSONLexer.java
JSONParser$ArrayContext.class    JSONParser$ValueContext.class  JSONBaseListener.class
JSONLexer.tokens                 JSONParser$JsonContext.class   JSONParser.class
JSONBaseListener.java            JSONListener.class
JSONParser$ObjectContext.class   JSONParser.java
```



TestRig / grun https://riptutorial.com/zh-CN/antlr/topic/3270/testrig---grun

7:

Examples

#ANTLR。

```
// Rule
type : int     #typeInt
     | short   #typeShort
     | long    #typeLong
     | string  #typeString
     ;

// Tokens
int : 'int' ;
short : 'short' ;
long : 'long' ;
string : 'string' ;
```

ParseTreeListener

```
public void enterTypeInt(TypeShortContext ctx);
public void enterTypeShort(TypeIntContext ctx);
public void enterTypeLong(TypeLongContext ctx);
public void enterTypeString(TypeStringContext ctx);
```

https://riptutorial.com/zh-CN/antlr/topic/6717/

8:

ANTLRwalker。visit。。

Examples

Expr.g4

```
grammar Expr;
prog:    (expr NEWLINE)* ;
expr:    expr ('*'|'/') expr

    |    expr ('+'|'-') expr
    |    INT
    |    '(' expr ')'
    ;
NEWLINE : [\r\n]+ ;
INT     : [0-9]+ ;
```

```
 -visitor           generate parse tree visitor
 -no-visitor        don't generate parse tree visitor (default)
```

commandline / terminal

```
java - jar antlr-4.5.3-complete.jar Expr.g4 -visitor
java - jar antlr-4.5.3-complete.jar Expr.g4 -no-visitor
```

/。

ExprBaseVisitor.javaExprVisitor.java。Java。ExprBaseVisitor。

```
// Generated from Expr.g4 by ANTLR 4.5.3
import org.antlr.v4.runtime.tree.AbstractParseTreeVisitor;

/**
 * This class provides an empty implementation of {@link ExprVisitor},
 * which can be extended to create a visitor which only needs to handle a subset
 * of the available methods.
 *
 * @param <T> The return type of the visit operation. Use {@link Void} for
 * operations with no return type.
 */
public class ExprBaseVisitor<T> extends AbstractParseTreeVisitor<T> implements ExprVisitor<T>
{
    /**
     * {@inheritDoc}
     *
     * <p>The default implementation returns the result of calling
     * {@link #visitChildren} on {@code ctx}.</p>
     */
    @Override public T visitProg(ExprParser.ProgContext ctx) { return visitChildren(ctx); }
    /**
```

```
     * {@inheritDoc}
     *
     * <p>The default implementation returns the result of calling
     * {@link #visitChildren} on {@code ctx}.</p>
     */
    @Override public T visitExpr(ExprParser.ExprContext ctx) { return visitChildren(ctx); }
}
```

https://riptutorial.com/zh-CN/antlr/topic/8211/

S. No		Contributors
1	ANTLR	Athafoud, cb4, Community, D3181, Gábor Bakos, KvanTTT
2	ANTLR v3	Athafoud, cb4
3	ANTLR v4	Athafoud, cb4, Community, D3181, Devid, Gábor Bakos, GRosenberg, Lucas Trzesniewski
4	ANTLR/	D3181
5	Lexer4	Athafoud, bn., Loxley, Lucas Trzesniewski
6	TestRig / grun	bn., D3181, Lucas Trzesniewski, Pascal Le Merrer
7		bn., Lucas Trzesniewski
8		D3181