Source code analysis with SonarSource

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What’s source code analysis?

- Part of QA
- Extracts metrics from source code, and reports violations against rules
- Various types of rules :
  - Coding standards
  - Bugs
  - …

Why would you want to analyze source code?

- Refactor source code
- Performance problems
- Portability problems
- Coding standards
- Save time and money, as it’s faster than manual review

Existing tools for OpenEdge

- Limited number of tools :
  - Proparse analyses source code
  - Prolint detects pattern in Proparse output, and store the result
- Prolint output is quite minimalist

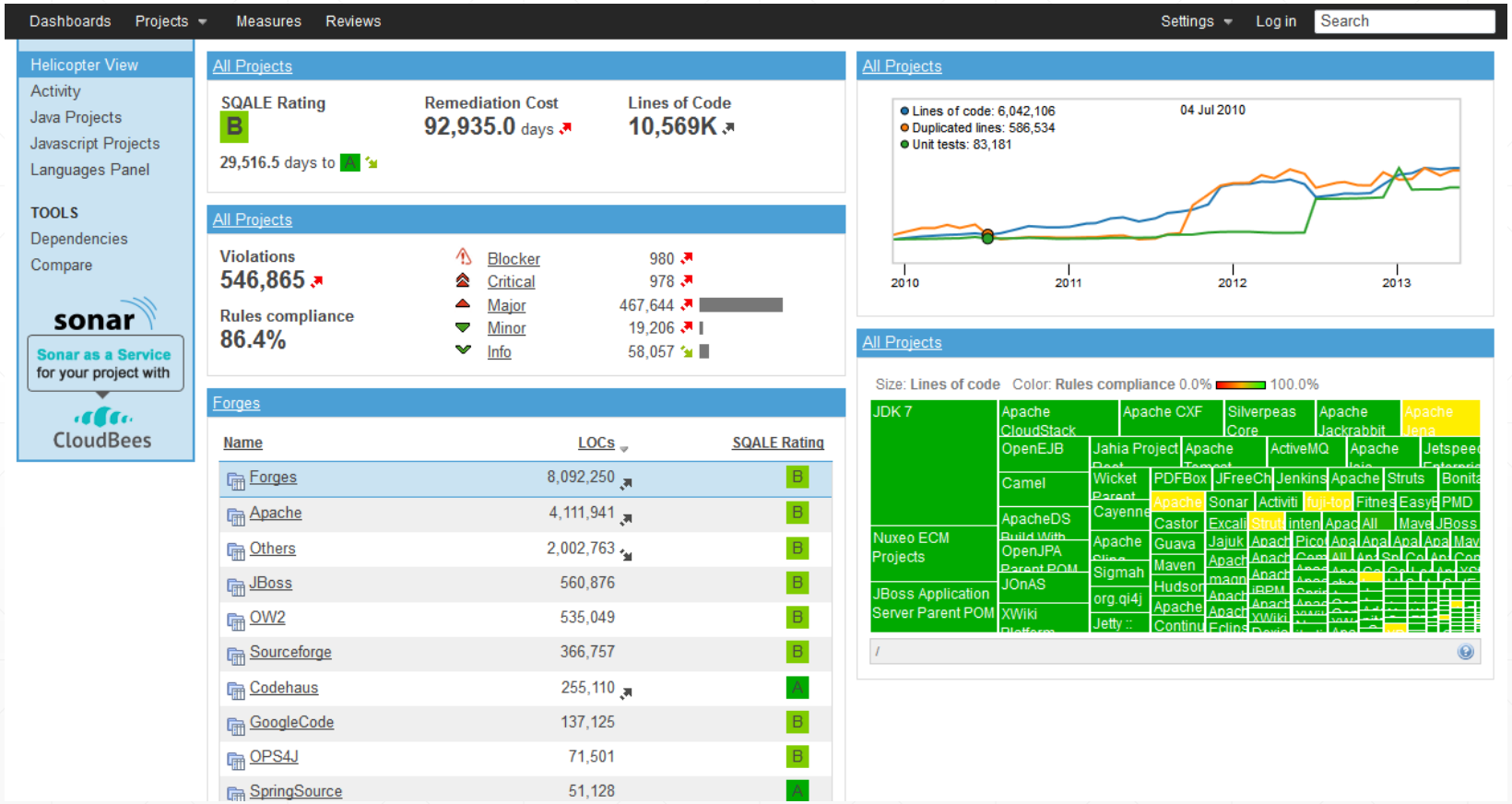
Compared to what's available in Java

- Bytecode analyzer : FindBugs, ObjectWeb ASM, …
- Static code analysis : Checkstyle, PMD, …
- Code coverage : JaCoCo, …

- And this is only for the opensource part.
- Many commercial products

And SonarSource to bind them all !

- SonarSource gather the results in a single database, and display them in a very nice web UI.



How does it work ?

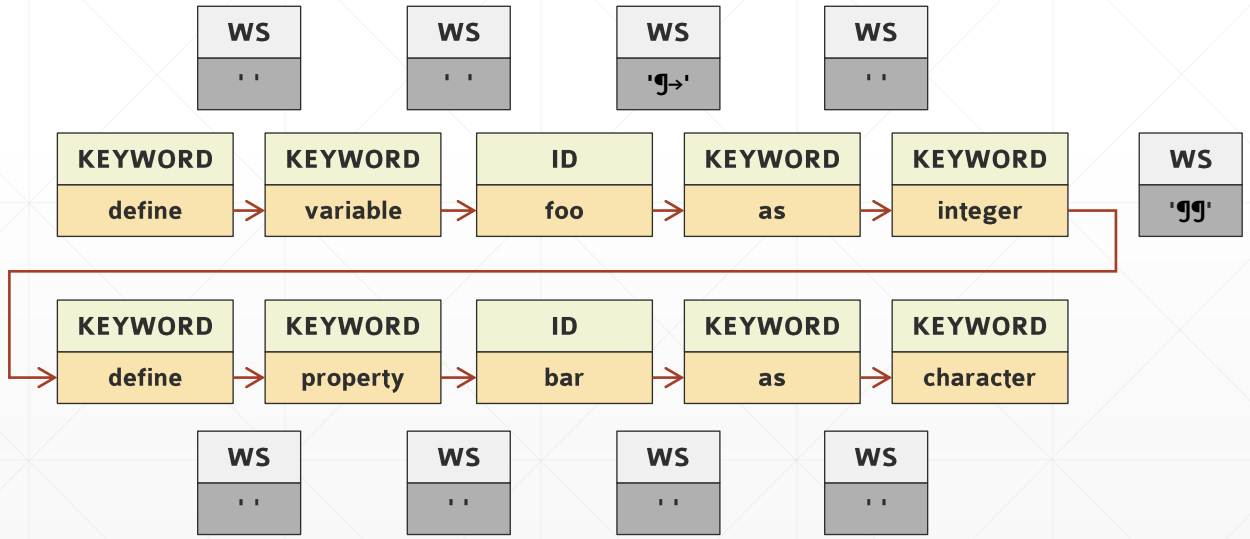
- Static code analysis usually rely on Lexer and Parsers
- Lexer converts a sequence of characters into a sequence of tokens
- Parser converts a sequence of tokens into a syntax tree

- Let’s see a simple example :

Lexer

- `KEYWORD : 'define' | 'variable' | 'property' | 'as' | 'character' | 'integer'`
- `WS : (' ' | '\t' | '\n')* -> HIDDEN`
- `ID : [a-zA-z]*`
- `EOS : '.'`

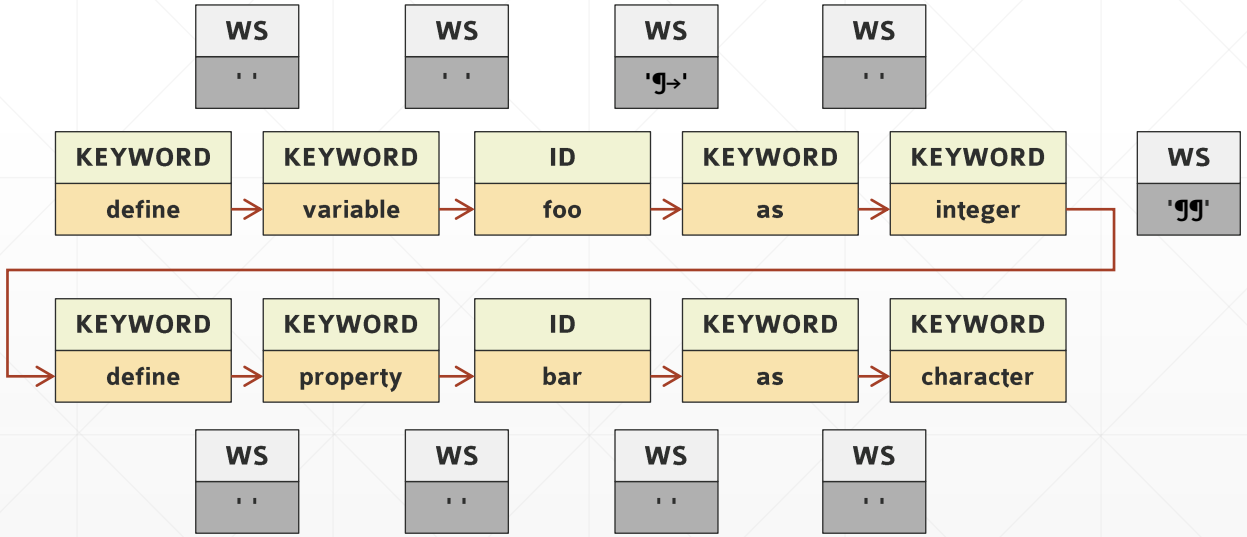
```
define␣variable␣␣foo¶
 → as␣integer.¶
¶
define␣property␣bar␣as␣character.
```

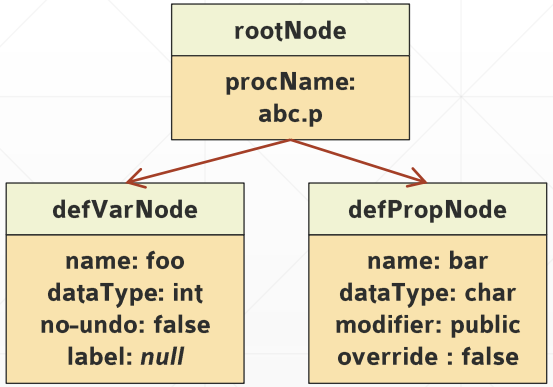


Parser

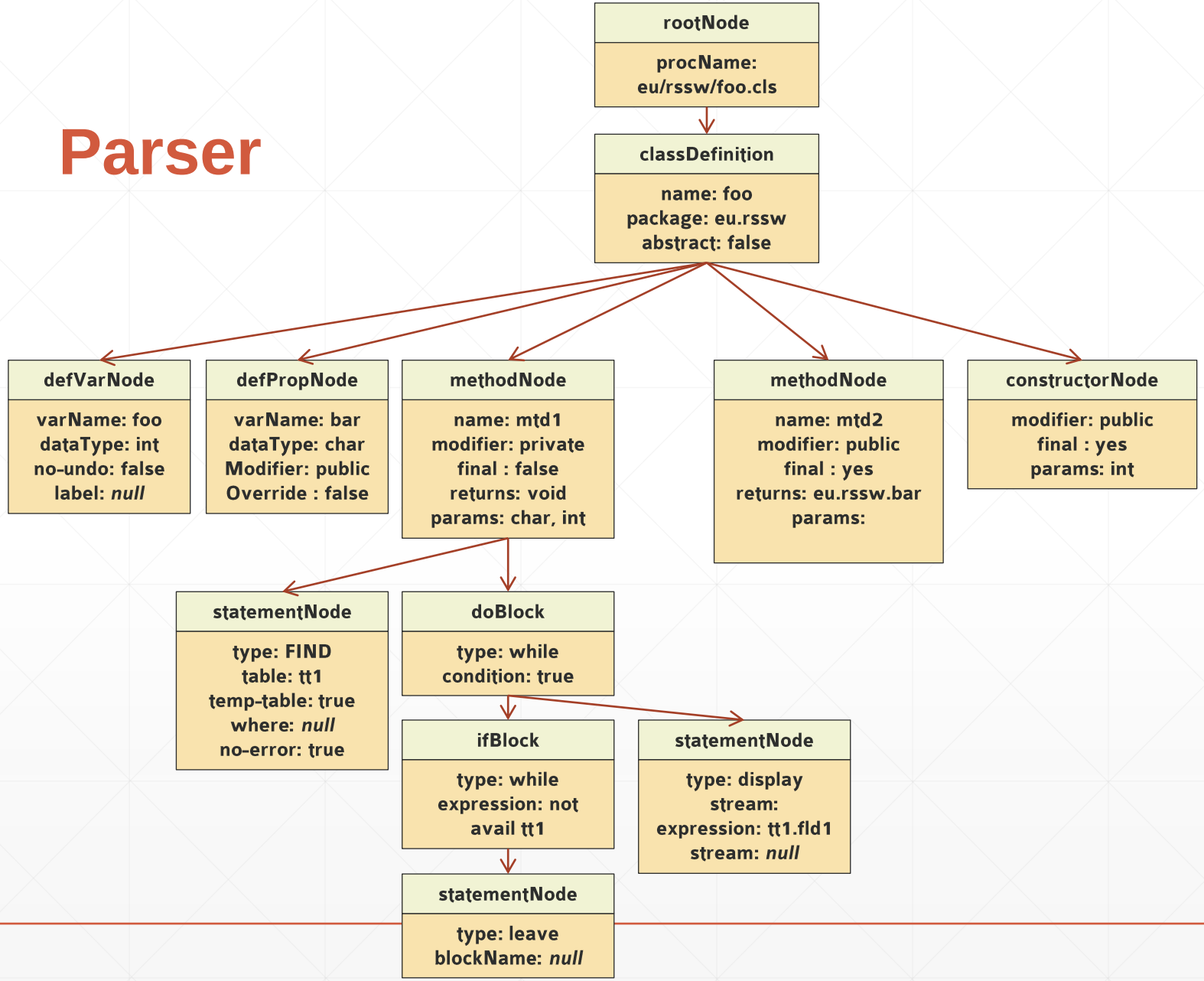
- defVar: KW_DEFINE KW_VARIABLE ID KW_AS DATATYPE KW_NO_UNDO? (KW_LABEL QUOTED_STRING)?

- defProp: KW_DEFINE (KW_PUBLIC | KW_PROTECTED | KW_PRIVATE)?
  (KW_STATIC | KW_ABSTRACT)? KW_OVERRIDE? KW_PROPERTY ID
  KW_AS (DATATYPE | CLASSNAME)





Parser


rootNode
procName: eu/rssw/foo.cls
classDefinition
name: foo
package: eu.rssw
abstract: false
defVarNode
varName: foo
dataType: int
no-undo: false
label: null
defPropNode
varName: bar
dataType: char
Modifier: public
Override : false
methodNode
name: mtd1
modifier: private
final : false
returns: void
params: char, int
methodNode
name: mtd2
modifier: public
final : yes
returns: eu.rssw.bar
params:
constructorNode
modifier: public
final : yes
params: int
statementNode
type: FIND
table: tt1
temp-table: true
where: null
no-error: true
doBlock
type: while
condition: true
ifBlock
type: while
expression: not avail tt1
statementNode
type: display
stream:
expression: tt1.fld1
stream: null
statementNode
type: leave
blockName: null

Only parsing source code ?

- Parsing can be done :
  - On profiler output (data structures for execution times, code coverage, …)
  - On DF files to know the database structure
  - On XREF files

Disclaimer

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OpenEdge extension for SonarSource

- SonarRunner is the batch process to analyse local source code, and push the results to the remote SonarSource instance
- An extension is made of several « sensors », each sensor analyzing a specific set of data
- Current sensors :
  - Rcode sensor
  - Dump files sensor
  - Code duplication sensor
  - Code coverage sensor
  - Source code sensor

Rcode sensor

- Extract information from rcode, and generate metrics :
  - Coupling between classes
  - Circular references between packages
  - Number of public / private methods
  - Common OO violations (using variables in classes, constructor for utility classes, …)

Dump file sensor

- Extract information from DF files:
  - Allow working with a known database structure when analyzing source code
  - Violations on table/field/index names, useless indexes, common SQL problems

Code duplication sensor

- Copy / paste is widely used during software development
- High code duplication means you should refactor your code
- Duplicated code usually mean that a fix is not applied everywhere

- Doesn’t do the refactor for you !

Code coverage sensor

- Use profiler output to exactly know which lines of code have been tested
- Multiple profiler files can be parsed and aggregated
- Let you know exactly which part of your code is being tested (or not tested)

Source code sensor

- Generate syntax tree from every class / procedure
- Then execute a set of lint rules, and report violations
- Source code uploaded to SonarSource server in order to display it with annotations
- Lint rules can be written by users

Writing your own rules

- Lint rules will have access either to the source tree, or to a fully built object
- The source tree know the exact position of your tokens
- Sonar entry point to report violations

- Rules have to be written in Java
- Implementation time is nothing compared to design time !

Lint rule example

```
// info is the object representing a class definition
if (!info.isAbstract() && !info.isInterface()) {
  for (MethodElement method : info.getMethods()) {
    if (method.isPublic() && !method.isStatic()) {
      boolean isImplementation = false;
      for (TypeInformation interfaces : info.getInterfaces()) {
        if (isImplementation(method, classInfos.get(interfaces.getName())))
            isImplementation = true;
      }
      if (isImplementation)
        System.out.println(" --> Method " + method.getName() + " is an implementation");
      else
        System.out.println(" --> Method " + method.getName() + " isn't an implementation");
    }
  }
```

Questions ?

Reference ?

- Sonar Source : http://www.sonarsource.com
- Sonar OE plugin demo site : http://sonar.riverside-software.fr

- Riverside Software : http://riverside-software.fr
- Gilles QUERRET : g.querret@riverside-software.fr