CODING STANDARDS CASE STUDY

With Open Source Tools

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100

times expensive fix defect after production.

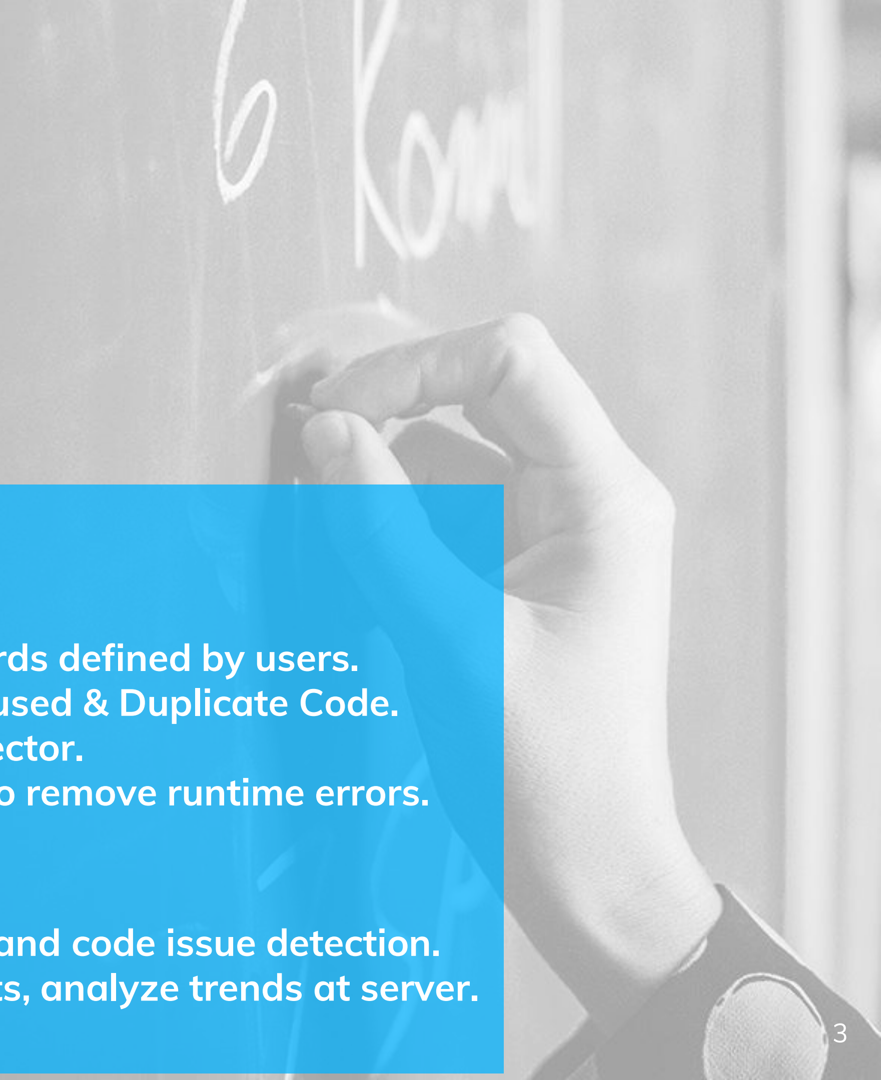
-IBM SSIR

IMPORTANCE

- Time dedicated to testing, debugging & verification is half of entire development cycle.

TARGETTED PROBLEMS

- Already existing large codebase maintenance & improvements.
- Consistency in code standards & customizations of code standards.
- Identifying possible optimizations & duplication of code.
- Verification of code at design level itself with multiple criteria.
- Analysis of Code Standardization trends.



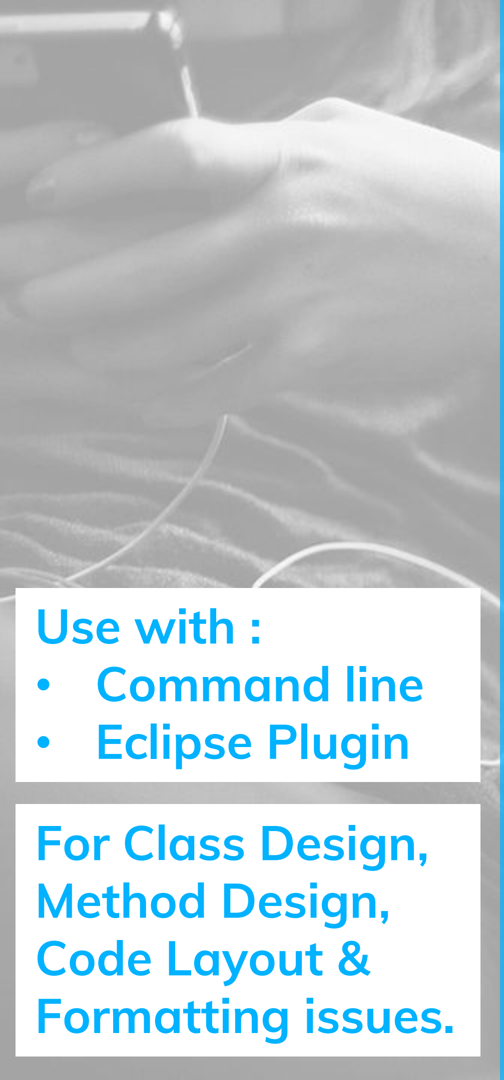
Tools

With their specialization

ToolSet-1	ToolSet-1
CheckStyle	For coding standards defined by users.
Pmd	Optimizations, Unused & Duplicate Code.
SpotBugs	Potential Bug Detector.
CheckerFramework	Code verification to remove runtime errors.
Alternatives	**Alternatives**
SonarLint	Coding Style, bug and code issue detection.
SonarQube	To generate reports, analyze trends at server.

What to use out the following tools ?

Analyze Fundamental Workings



Use with :
- Command line
- Eclipse Plugin

For Class Design, Method Design, Code Layout & Formatting issues.

CHECKSTYLE

Important Functional Checks

Categories Of Checks :

Annotations related checks like inline annotations, missing annotations.

Block Checks like nested, empty blocks, empty catch.

Class design checks like MutableExceptions, OnTopLevelClass.

Coding Standards like Declaration Order, Covariant Equals, EqualAvoidNull, HiddenField, Illegal Catch, MissingSwitchDefault, MutlipleStringLiterals, SimplyBooleanExpression, StringLiteralEquality, SuperFinalize.

Header define header properties.

Imports AvoidStarImport, AvoidStaticImport.

Javadoc checks like AtclauseOrder, JavadocMethod.

CHECKSTYLE

Important Functional Checks

Categories Of Checks :

Metric BooleanExpressionComplexity, DAC, CyclomaticComplexity.

Miscellaneous like Indetations, NewLineEOF.

Modifier checks like ModifierOrder, RedundantModifier.

Naming Conventions like Method, Abbreviations, Static, ConstantName, MemberName, ParameterName.

Regexp like regex expression exists.

Sizeviolations like FileLength, LineLength.

Whitespaces like FileTabCharacter.

Addition/Removal of checks allowed.

PMD

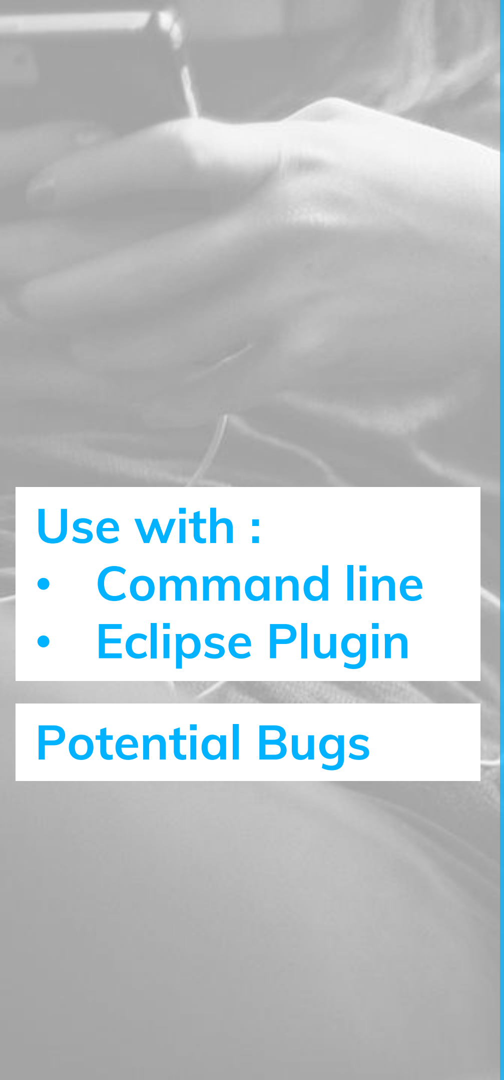
Important Functional Checks

- Common programming flaws like unused variables, empty catch blocks, unnecessary object creation. Additional CPD detector.
- pmd & cpd are separate tools to be used on command line interface, UI based interaction Eclipse Plugin.
- Custom rules additions in our own custom xml files and inclusions of
- Best Practices, Code Style, Design, Documentation, Error Prone, Multithreading, Performance and Security.
- Best practices is to use custom rules & Suppress Warnings in code if specific code analysis not needed.
- Works for Java as well as for JSPs.

Use with :

- **Command line**
- **Eclipse Plugin**

Coding Standards
Antipatterns
CTRL+C/V detector



Use with :

- Command line
- Eclipse Plugin

Potential Bugs

SPOTBUGS

Important Functional Checks

- Bad Practice like include hashcode & equals method.
- Comparison of String using == or !=
- Class define hashCode() but not uses equals() from Object. Or vice-versa.
- Class name capital, confusing method names differ only in capitalization.
- Correctness non-null fields null, infinite loops, method argument might be null, Invalid Min & Max method combination.

- **Other categories are multithreaded, vulnerability, performance, security, dodgy code.**

CheckerFramework Type Analysis

This tool verifies the code, if no error pointed by this tool against particular system then no error exists.

Superior behavior then Findbugs. It is a bug detector not remover.

Important General Type Systems

- **Nullness Checker** verifies for NullPointerExceptions, Initialization and raw types errors. It also consist of MapKeyChecker.
- **Interning Checker** verifies at all places correct use '==' is there instead of equals().
- **Lock Checker** for checking concurrency errors and check guards.
- **Tainting Checker** for checking untrusted SQL queries doesn't get parsed.
- **I18n Format Checker** for checking that formatted strings are correctly formed.
- **Regex Checker** valid regex expression are checked.

- CLI usage

  With javac

  With jars

Runtime Exception caught at Compile time.

Annotations are required for this.

- CLI usage

  With javac

  With jars

Runtime Exception caught at Compile time.

Integration with Jenkins for reports.

SonarLint & SonarQube

This tool verifies the code, if no error pointed by this tool against particular system then no error exists.

Superior behavior then Findbugs. It is a bug detector not remover.

SonarQube Features

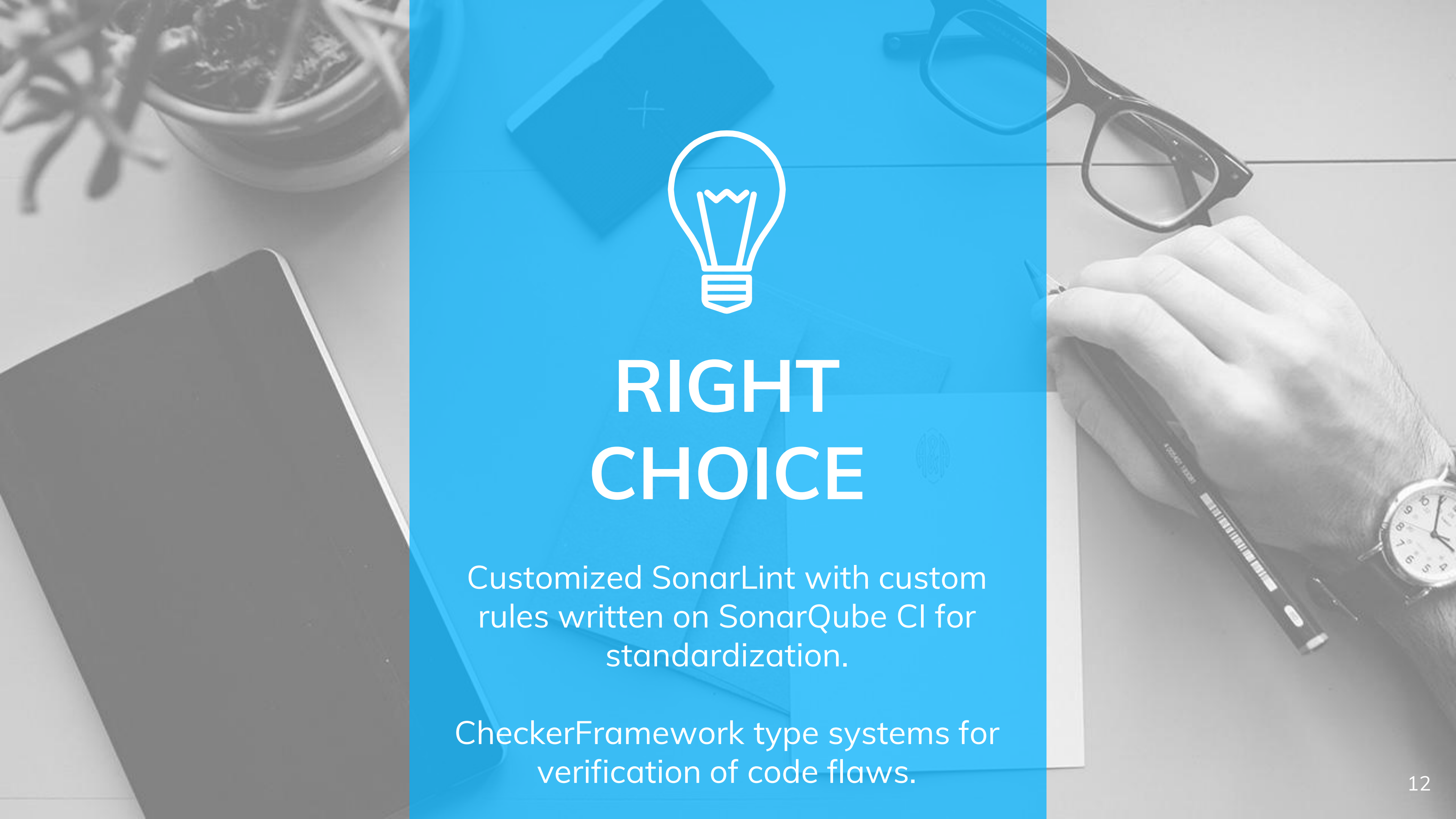
- **Unit testing and code coverage by these test cases.**
- **Duplicity, design/architecture & Code Complexity.**
- **Historical Reports for, code quality improvements.**
- **Long reports & time consumption is a disadvantage. But, on the fly feature is a help.**

Static Analysis

- A violation might not result in failing build or will be an error at all.
- Tools are needed to be modified & used according to our need.
- Too many rules, lead too much verbose, false positives.

Conclusion – Project Specific

- Need to check against few coding standards for java and jsp programs.
- See the most critical coding properties being it vulnerabilities, bad practices and few potential bugs to detect.
- Verification of code is a plus for static analysis of code.



RIGHT CHOICE

Customized SonarLint with custom rules written on SonarQube CI for standardization.

CheckerFramework type systems for verification of code flaws.

“Quality is never an accident. It is always an intelligent effort.”

Thanks!

Any questions?

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