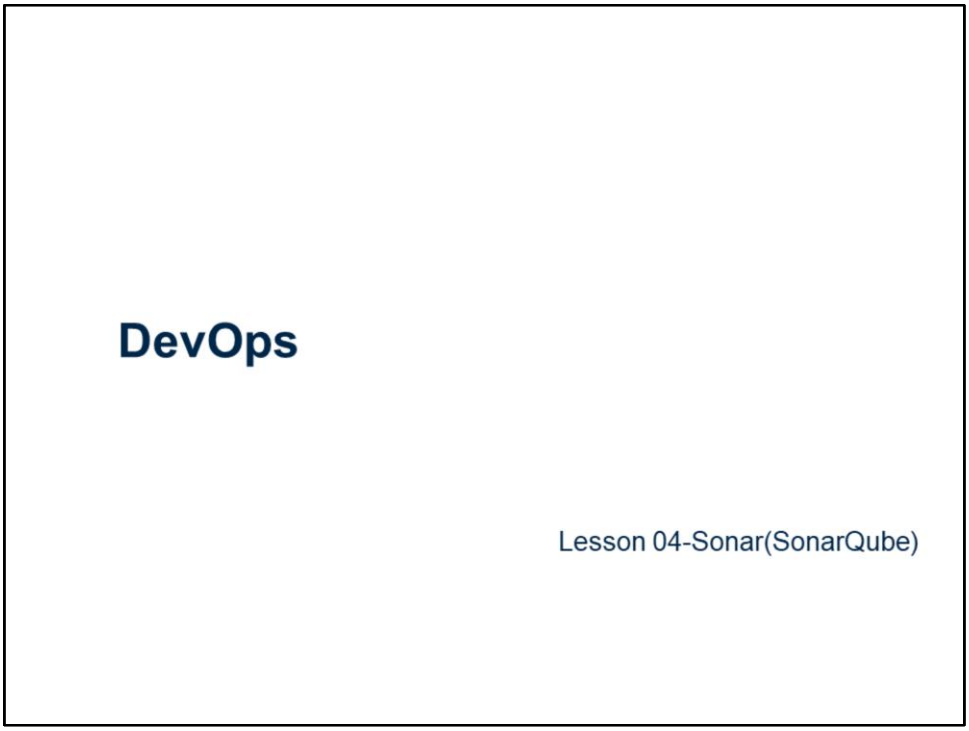
Instructor Notes:

Add instructor notes here.

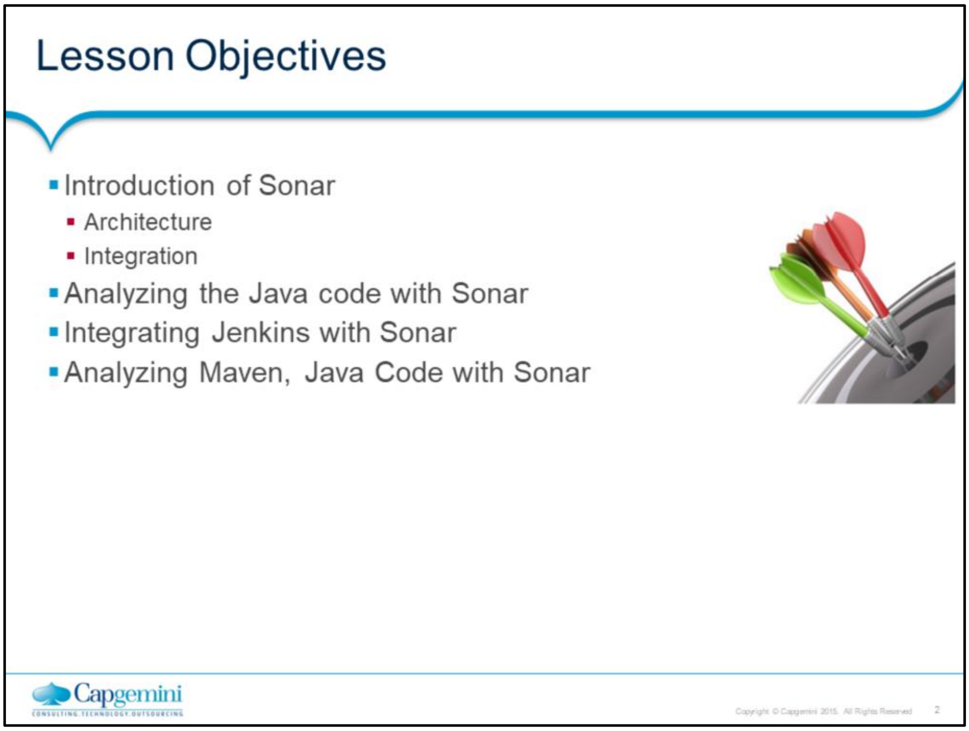


DevOps

Lesson 04-Sonar(SonarQube)

Instructor Notes:

Add instructor notes here.

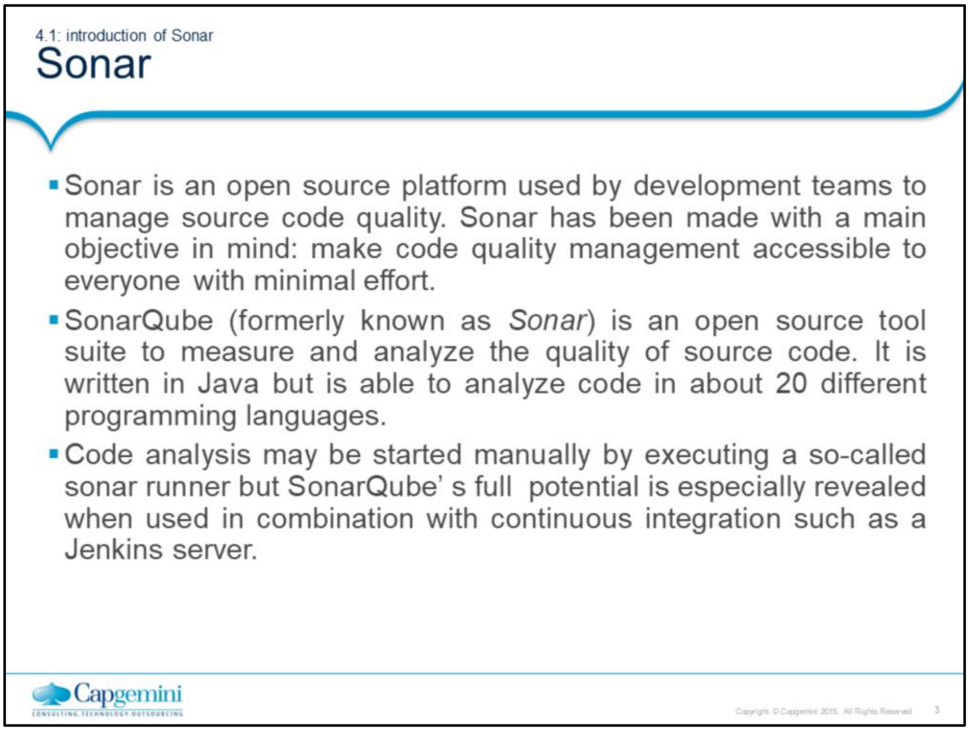


Lesson Objectives

- Introduction of Sonar
  - Architecture
  - Integration
- Analyzing the Java code with Sonar
- Integrating Jenkins with Sonar
- Analyzing Maven, Java Code with Sonar

Instructor Notes:

Add instructor notes here.



4.1: introduction of Sonar

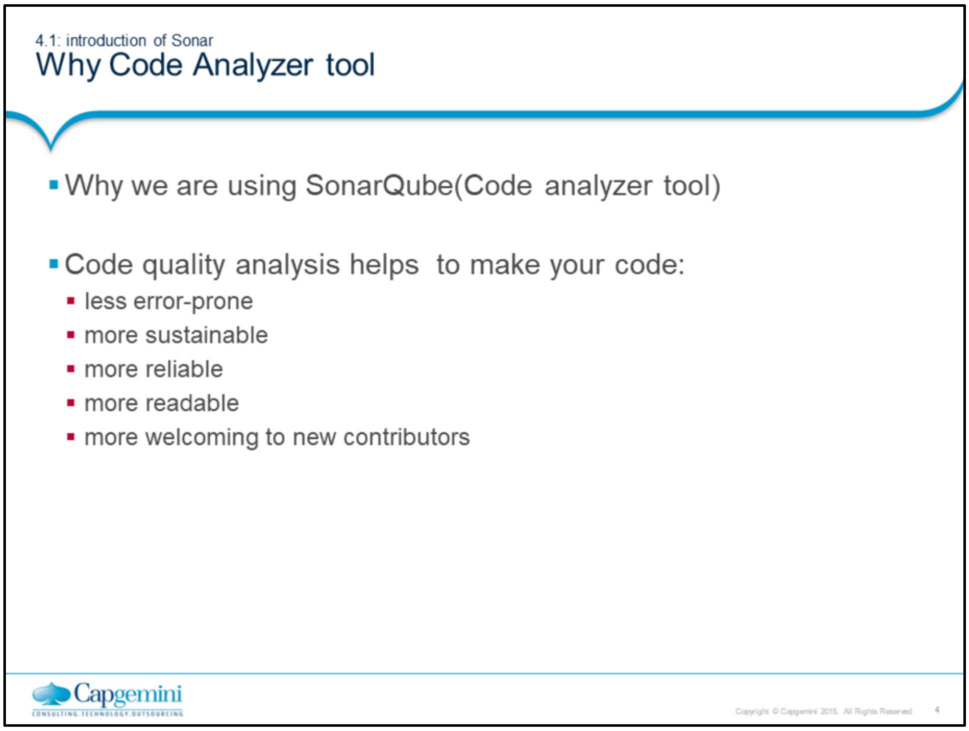
Sonar

- Sonar is an open source platform used by development teams to manage source code quality. Sonar has been made with a main objective in mind: make code quality management accessible to everyone with minimal effort.
- SonarQube (formerly known as *Sonar*) is an open source tool suite to measure and analyze the quality of source code. It is written in Java but is able to analyze code in about 20 different programming languages.
- Code analysis may be started manually by executing a so-called sonar runner but SonarQube' s full potential is especially revealed when used in combination with continuous integration such as a Jenkins server.

Add the notes here.

Instructor Notes:

Add instructor notes here.



4.1: introduction of Sonar

Why Code Analyzer tool

- Why we are using SonarQube(Code analyzer tool)
- Code quality analysis helps to make your code:
  - less error-prone
  - more sustainable
  - more reliable
  - more readable
  - more welcoming to new contributors

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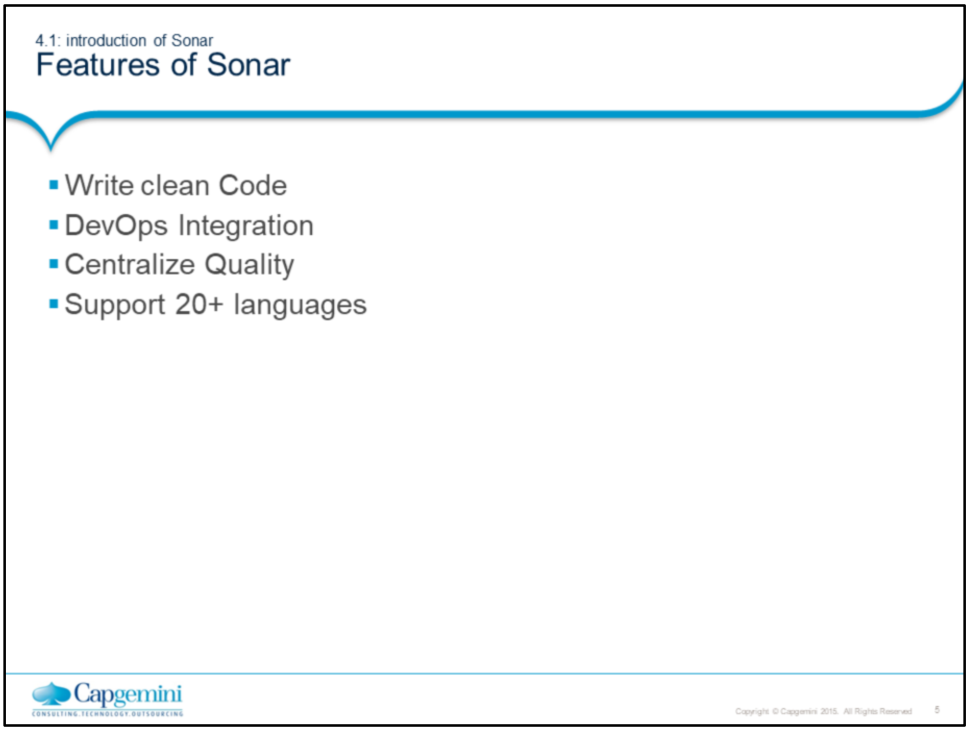
Code quality analysis mainly relies on a set of tools that look at your code and give you hints. The most famous tools are Findbugs, PMD, Checkstyle but also code coverage tools such as Jacoco. JDT itself provides very powerful quality checks, but there are not enabled by default. You should go to Error/Warnings in preferences and replace all "ignore" by "Warning".

Instructor Notes:

Add instructor notes here.



4.1: introduction of Sonar

Features of Sonar

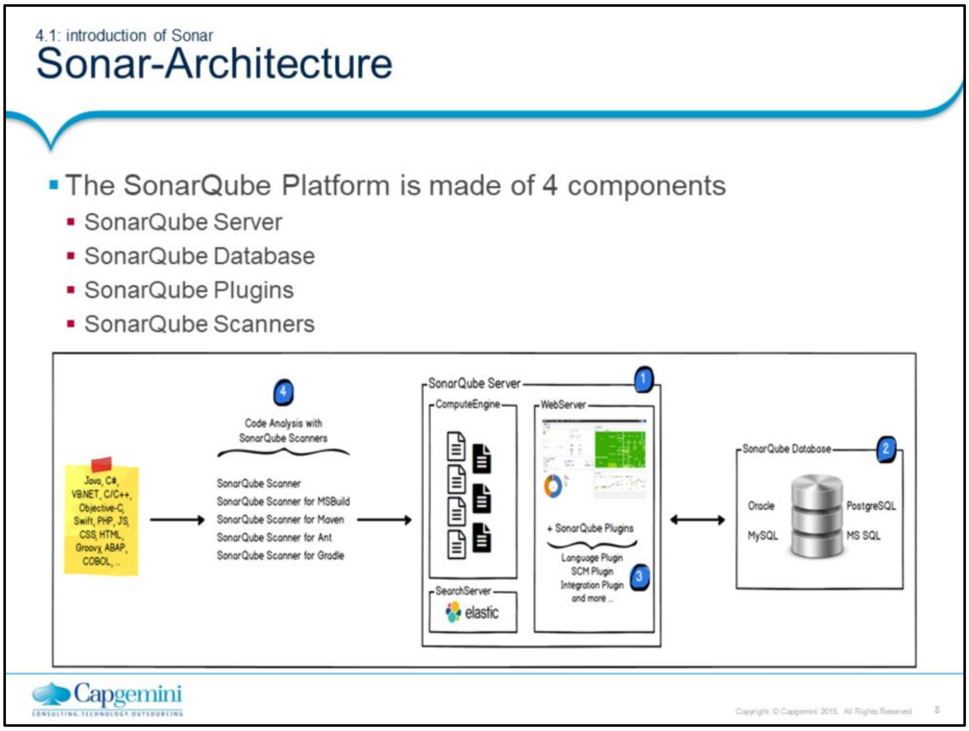
- Write clean Code
- DevOps Integration
- Centralize Quality
- Support 20+ languages

5

Write clean code
Overall health
Your project home page shows where you stand in terms of quality in a glimpse of an eye. This main page also shows you an immediate sense of the good results achieved over time.
Focus on the Leak
The water leak paradigm is a simple yet powerful way to manage code quality: quality of new - changed and added - code should be put under control before anything else. Once that Leak is under control, code quality will start improving mechanically. In SonarQube, the Leak is a built-in concept that you can’t miss. Once you’ve had a look at this yellow area on the left of your project home page, you will always remain focused on it to not miss any new issues.
Enforce Quality Gate
With SonarQube, a developer has everything at hand to take ownership of the quality of his code. To fully enforce a code quality practice across all teams, you need to set up a Quality Gate. This core concept of SonarQube is a set of requirements that tells whether or not a new version of a project can go into production. SonarQube’s default Quality Gate checks what happened on the Leak period and fails if your new code got worse in this period.
Analyze pull requests
Once you have SonarQube in place, you will quickly want to make sure you add as few issues as possible to your code base. To shorten the feedback loop so you don’t have to wait for new analyses to be available on SonarQube, you can set up the analysis of your pull requests. Analyses will be run on your feature branches without being pushed to SonarQube, giving you the opportunity to fix issues before they ever reach SonarQube!

Instructor Notes:

How sonar works give idea.



4.1: introduction of Sonar

Sonar-Architecture

- The SonarQube Platform is made of 4 components
  - SonarQube Server
  - SonarQube Database
  - SonarQube Plugins
  - SonarQube Scanners

Java, C#, VB.NET, C/C++, Objective-C, Swift, PHP, JS, CSS, HTML, Groovy, ABAP, COBOL, ...
4
Code Analysis with SonarQube Scanners
SonarQube Scanner
SonarQube Scanner for MSBuild
SonarQube Scanner for Maven
SonarQube Scanner for Ant
SonarQube Scanner for Gradle
SonarQube Server
1
ComputeEngine
WebServer
+ SonarQube Plugins
Language Plugin
SCM Plugin
Integration Plugin
and more ...
3
SearchServer
elastic
SonarQube Database
2
Oracle
MySQL
PostgreSQL
MS SQL

8

The SonarQube Platform is made of 4 components:
One **SonarQube Server** starting 3 main processes:

a **Web Server** for developers, managers to browse quality snapshots and configure the SonarQube instance
a **Search Server** based on Elasticsearch to back searches from the UI
a **Compute Engine Server** in charge of processing code analysis reports and saving them in the SonarQube Database

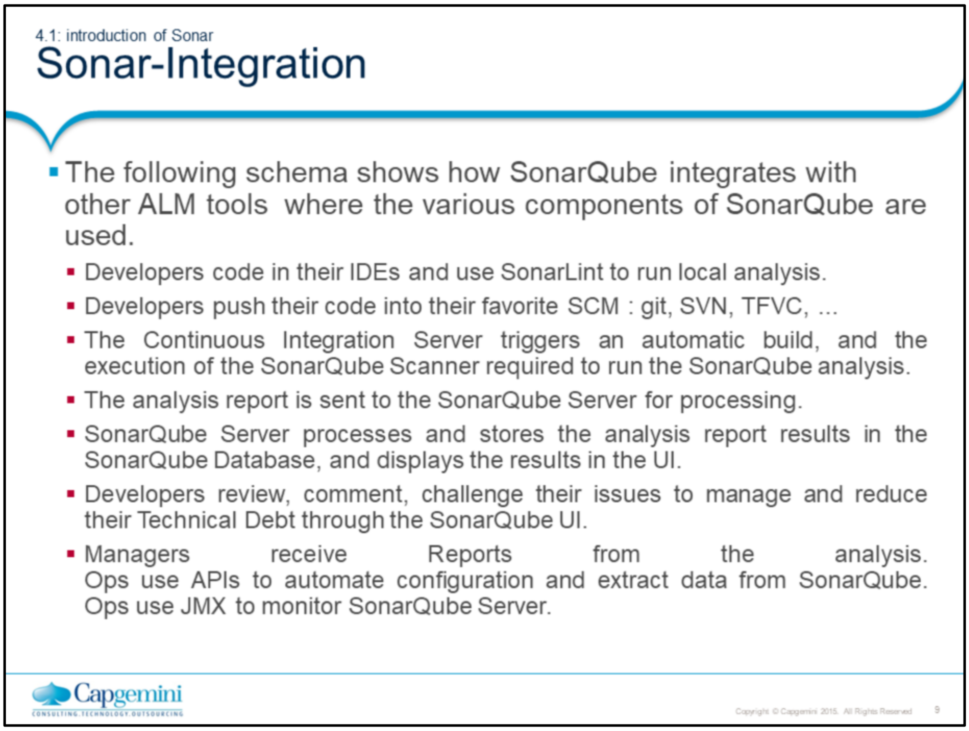
One **SonarQube Database** to store:

the configuration of the SonarQube instance (security, plugins settings, etc.)
the quality snapshots of projects, views, etc.

Multiple **SonarQube Plugins** installed on the server, possibly including language, SCM, integration, authentication, and governance plugins
One or more **SonarQube Scanners** running on your Build / Continuous Integration Servers to analyze projects

Instructor Notes:

Add instructor notes here.



4.1: introduction of Sonar

Sonar-Integration

- The following schema shows how SonarQube integrates with other ALM tools where the various components of SonarQube are used.
  - Developers code in their IDEs and use SonarLint to run local analysis.
  - Developers push their code into their favorite SCM : git, SVN, TFVC, ...
  - The Continuous Integration Server triggers an automatic build, and the execution of the SonarQube Scanner required to run the SonarQube analysis.
  - The analysis report is sent to the SonarQube Server for processing.
  - SonarQube Server processes and stores the analysis report results in the SonarQube Database, and displays the results in the UI.
  - Developers review, comment, challenge their issues to manage and reduce their Technical Debt through the SonarQube UI.
  - Managers receive Reports from the analysis. Ops use APIs to automate configuration and extract data from SonarQube. Ops use JMX to monitor SonarQube Server.

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The SonarQube Platform is made of 4 components:
One **SonarQube Server** starting 3 main processes:

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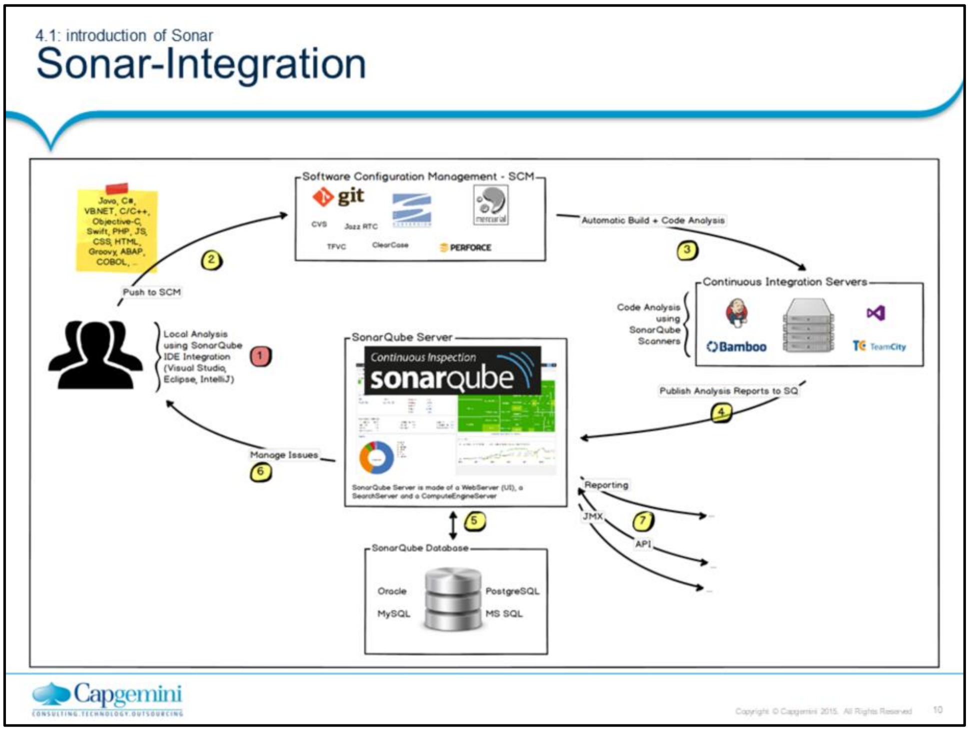
One or more **SonarQube Scanners** running on your Build / Continuous Integration Servers to analyze projects

Instructor Notes:

Give idea of flow



4.1: introduction of Sonar

Sonar-Integration

Java, C#, VB.NET, C/C++, Objective-C, Swift, PHP, JS, CSS, HTML, Groovy, ABAP, COBOL, ...
Software Configuration Management - SCM
git
CVS
Jazz RTC
TFVC
ClearCase
PERFORCE
mercurial
Automatic Build + Code Analysis
3
Continuous Integration Servers
Code Analysis using SonarQube Scanners
Bamboo
TeamCity
2
Push to SCM
Local Analysis using SonarQube IDE Integration (Visual Studio, Eclipse, IntelliJ)
1
SonarQube Server
Continuous Inspection
sonarqube
SonarQube Server is made of a WebServer (UI), a SearchServer and a ComputeEngineServer
Publish Analysis Reports to SQ
4
Manage Issues
6
Reporting
JMX
7
API
5
SonarQube Database
Oracle
MySQL
PostgreSQL
MS SQL
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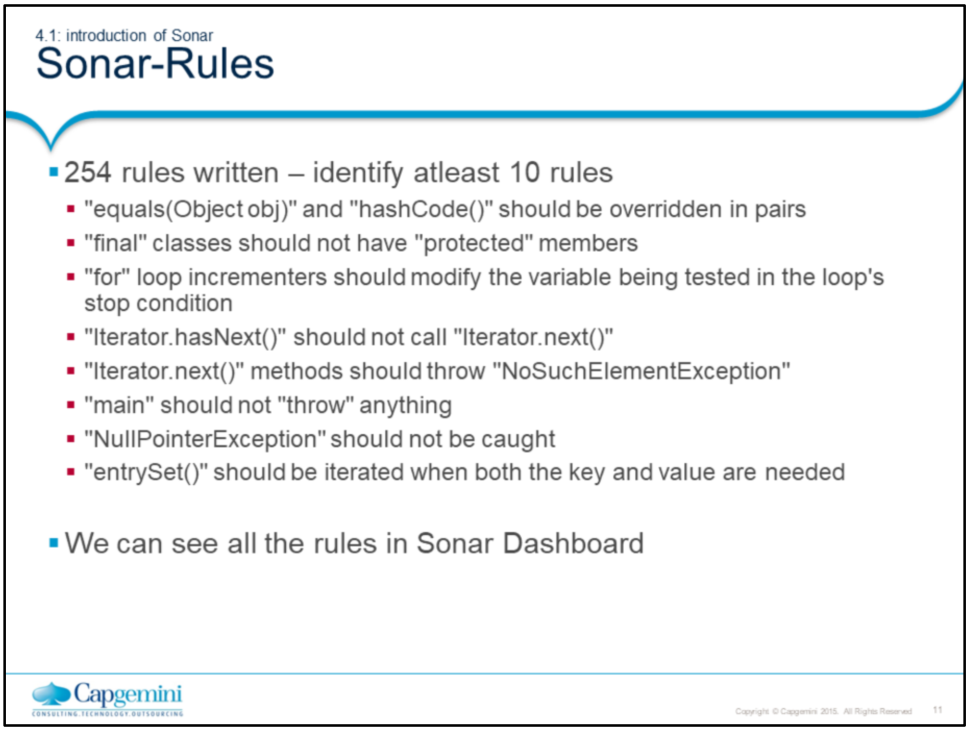
About Machines and Locations
The SonarQube Platform cannot have more than one SonarQube Server and one SonarQube Database.
For optimal performance, each component (server, database, scanners) should be installed on a separate machine, and the server machine should be dedicated.
SonarQube Scanners scale by adding machines.
All machines must be time synchronized.
The SonarQube Server and the SonarQube Database must be located in the same network
SonarQube Scanners don't need to be on the same network as the SonarQube Server.
There is **no communication** between **SonarQube Scanners** and the **SonarQube Database**.

Instructor Notes:

Add instructor notes here.



4.1: introduction of Sonar

Sonar-Rules

- 254 rules written – identify atleast 10 rules
  - "equals(Object obj)" and "hashCode()" should be overridden in pairs
  - "final" classes should not have "protected" members
  - "for" loop incrementers should modify the variable being tested in the loop's stop condition
  - "Iterator.hasNext()" should not call "Iterator.next()"
  - "Iterator.next()" methods should throw "NoSuchElementException"
  - "main" should not "throw" anything
  - "NullPointerException" should not be caught
  - "entrySet()" should be iterated when both the key and value are needed
- We can see all the rules in Sonar Dashboard

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About Machines and Locations
The SonarQube Platform cannot have more than one SonarQube Server and one SonarQube Database.
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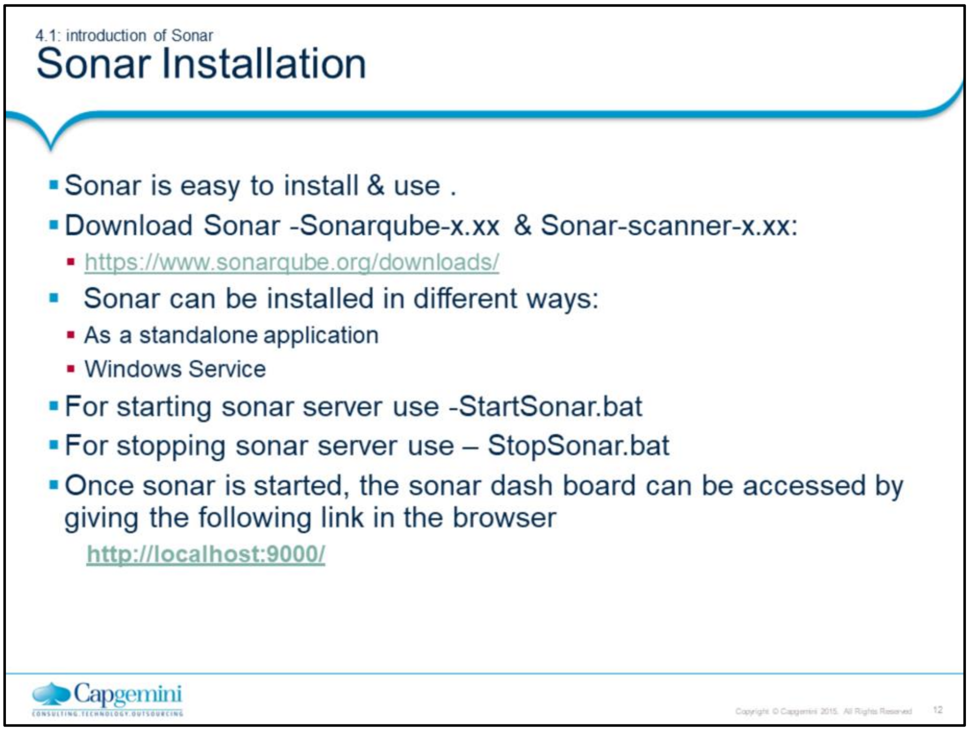
Instructor Notes:

Give Demo example



4.1: introduction of Sonar

Sonar Installation

- Sonar is easy to install & use .
- Download Sonar -Sonarqube-x.xx & Sonar-scanner-x.xx:
  - https://www.sonarqube.org/downloads/
- Sonar can be installed in different ways:
  - As a standalone application
  - Windows Service
- For starting sonar server use -StartSonar.bat
- For stopping sonar server use – StopSonar.bat
- Once sonar is started, the sonar dash board can be accessed by giving the following link in the browser

  http://localhost:9000/

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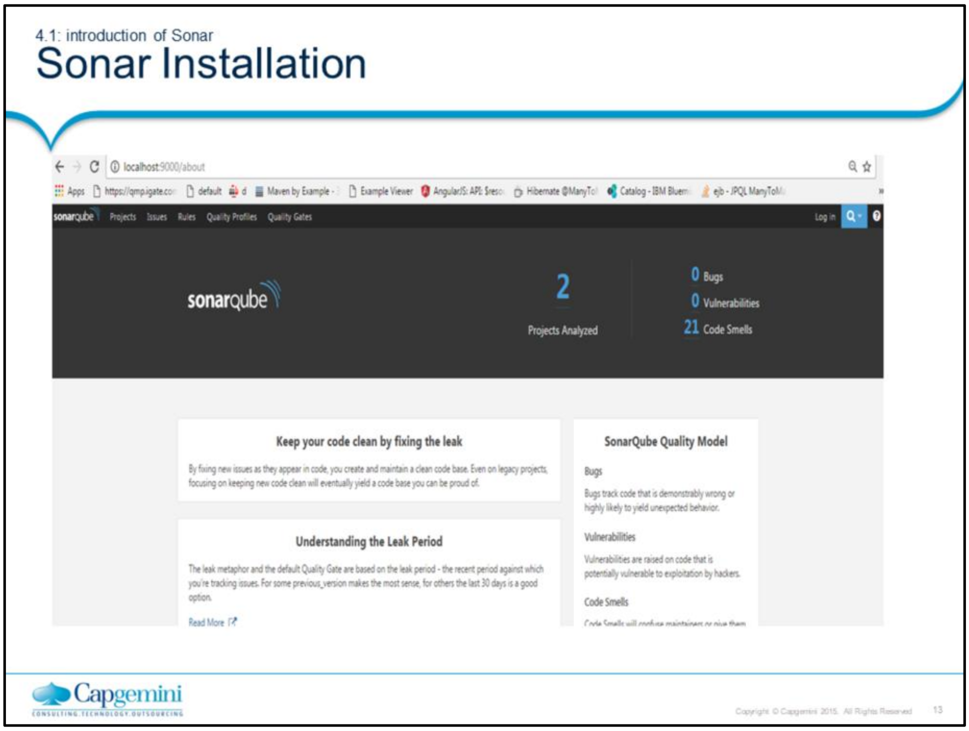
Add the notes here.

Instructor Notes:

Add instructor notes here.



4.1: introduction of Sonar

Sonar Installation

2
Projects Analyzed

0 Bugs
0 Vulnerabilities
21 Code Smells

Keep your code clean by fixing the leak

By fixing new issues as they appear in code, you create and maintain a clean code base. Even on legacy projects, focusing on keeping new code clean will eventually yield a code base you can be proud of.

Understanding the Leak Period

The leak metaphor and the default Quality Gate are based on the leak period - the recent period against which you're tracking issues. For some previous_version makes the most sense, for others the last 30 days is a good option.

Read More

SonarQube Quality Model

Bugs

Bugs track code that is demonstrably wrong or highly likely to yield unexpected behavior.

Vulnerabilities

Vulnerabilities are raised on code that is potentially vulnerable to exploitation by hackers.

Code Smells

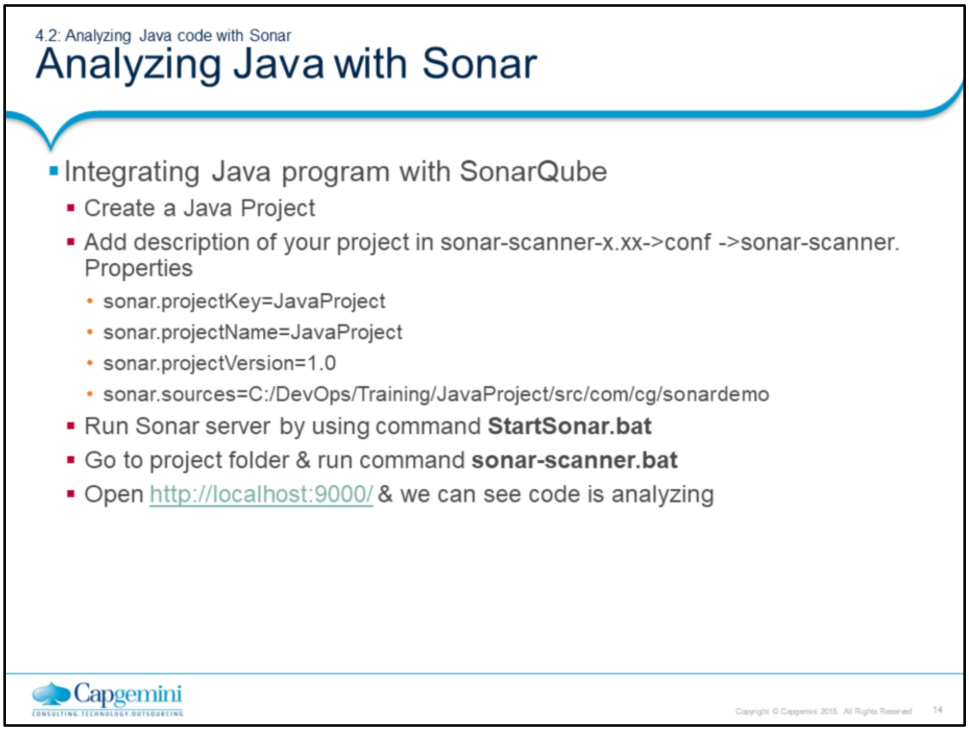
Code Smells will confuse maintainers or give them

13

Add the notes here.

Instructor Notes:

Add instructor notes here.



4.2: Analyzing Java code with Sonar

Analyzing Java with Sonar

- Integrating Java program with SonarQube
  - Create a Java Project
  - Add description of your project in sonar-scanner-x.xx->conf ->sonar-scanner. Properties
    - sonar.projectKey=JavaProject
    - sonar.projectName=JavaProject
    - sonar.projectVersion=1.0
    - sonar.sources=C:/DevOps/Training/JavaProject/src/com/cg/sonardemo
  - Run Sonar server by using command **StartSonar.bat**
  - Go to project folder & run command **sonar-scanner.bat**
  - Open http://localhost:9000/ & we can see code is analyzing

Add the notes here.

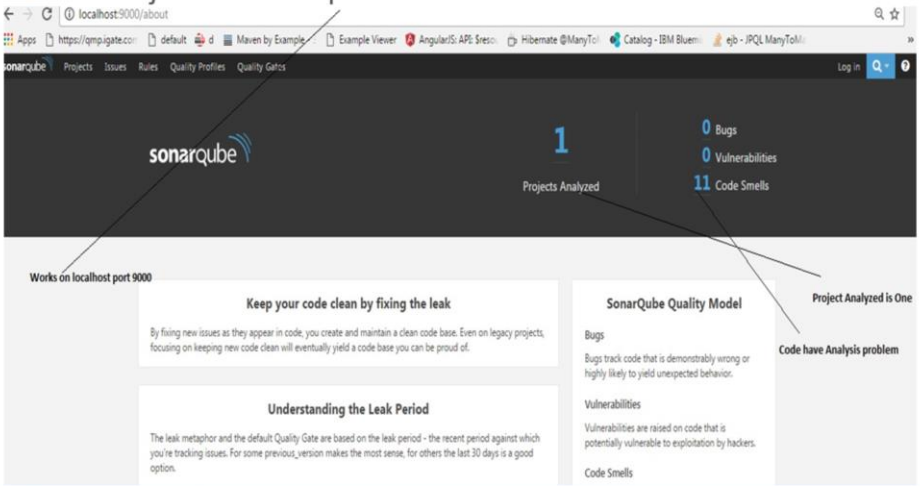
Instructor Notes:

Add instructor notes here.

4.2: Analyzing Java code with Sonar

Analyzing Java with Sonar

- First Project run on http://localhost:9000



Works on localhost port 9000

Project Analyzed is One

Code have Analysis problem

Keep your code clean by fixing the leak

By fixing new issues as they appear in code, you create and maintain a clean code base. Even on legacy projects, focusing on keeping new code clean will eventually yield a code base you can be proud of.

Understanding the Leak Period

The leak metaphor and the default Quality Gate are based on the leak period - the recent period against which you're tracking issues. For some previous_version makes the most sense, for others the last 30 days is a good option.

SonarQube Quality Model

Bugs

Bugs track code that is demonstrably wrong or highly likely to yield unexpected behavior.

Vulnerabilities

Vulnerabilities are raised on code that is potentially vulnerable to exploitation by hackers.

Code Smells

Add the notes here.

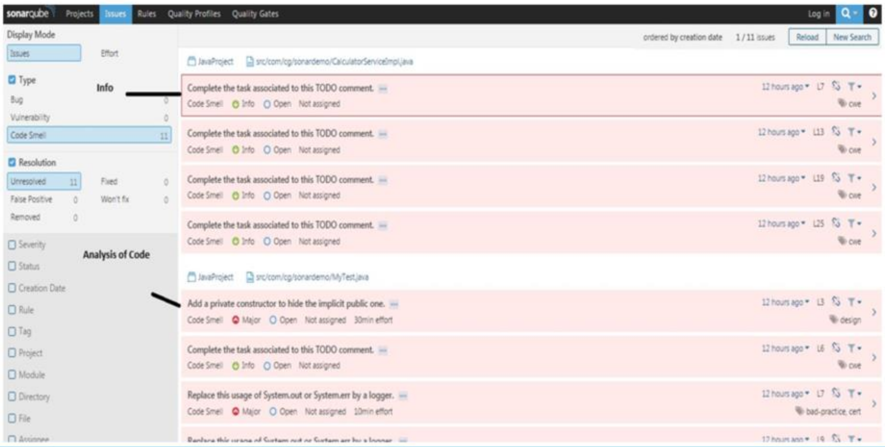
Instructor Notes:

Give Demo example

4.2: Analyzing Java code with Sonar

Analyzing Java with Sonar

- Select code smell after log in ,you will get all kind of major and minor problems



JavaProject src/com/cg/sonardemo/CalculatorServiceImpl.java

Complete the task associated to this TODO comment.
Code Smell Info Open Not assigned 12 hours ago L7 cwe

Complete the task associated to this TODO comment.
Code Smell Info Open Not assigned 12 hours ago L13 cwe

Complete the task associated to this TODO comment.
Code Smell Info Open Not assigned 12 hours ago L19 cwe

Complete the task associated to this TODO comment.
Code Smell Info Open Not assigned 12 hours ago L25 cwe

JavaProject src/com/cg/sonardemo/MyTest.java

Add a private constructor to hide the implicit public one.
Code Smell Major Open Not assigned 30min effort 12 hours ago L3 design

Complete the task associated to this TODO comment.
Code Smell Info Open Not assigned 12 hours ago L6 cwe

Replace this usage of System.out or System.err by a logger.
Code Smell Major Open Not assigned 10min effort 12 hours ago L7 bad-practice, cert

Replace this usage of System.out or System.err by a logger. 12 hours ago L9

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Each issue has one of five severities:
BLOCKER
Bug with a high probability to impact the behavior of the application in production: memory leak, unclosed JDBC connection, ... The code MUST be immediately fixed.
CRITICAL
Either a bug with a low probability to impact the behavior of the application in production or an issue which represents a security flaw: empty catch block, SQL injection, ... The code MUST be immediately reviewed.
MAJOR
Quality flaw which can highly impact the developer productivity: uncovered piece of code, duplicated blocks, unused parameters, ...
MINOR
Quality flaw which can slightly impact the developer productivity: lines should not be too long, "switch" statements should have at least 3 cases, ...
INFO
Neither a bug nor a quality flaw, just a finding.
Technical Review
Confirm, False Positive, Won't Fix, Change Severity, and Resolve fall into this category, which presumes an initial review of an issue to verify its validity. Assume it's time to review the technical debt added in the last review period - whether that's a day, a week, or an entire sprint. You go through each new issue and do one:

Confirm - By confirming an issue, you're basically saying "Yep, that's a problem." Doing so moves it out of "Open" status to "Confirmed".
False Positive - Looking at the issue in context, you realize that for whatever reason, this issue isn't actually an ~~issue~~, erm... "problem." It's not actually a problem. So you mark it False Positive and move on. Requires Administer Issues permission on the project.
Won't Fix - Looking at the issue in context, you realize that while it's a valid issue it's not one that actually needs fixing. In other words, it represents accepted technical debt. So you mark it Won't Fix and move on. Requires Administer Issues permission on the project.
Change Severity - This is the middle ground between the first two options. Yes, it's a problem, but it's not as bad a problem as the rule's default severity makes it out to be. Or perhaps it's actually far worse. Either way, you adjust the severity of the issue to bring it in line with what you feel it deserves. The marker in the drilldown will change to show the new severity immediately, but the change won't be reflected in your issue counts until after the next analysis. Requires Administer Issues permission on the project.
Resolve - If you think you've fixed an open issue, you can Resolve it. If you're right, the next analysis will move it to closed status. If you're wrong, its status will go to re-opened.
.

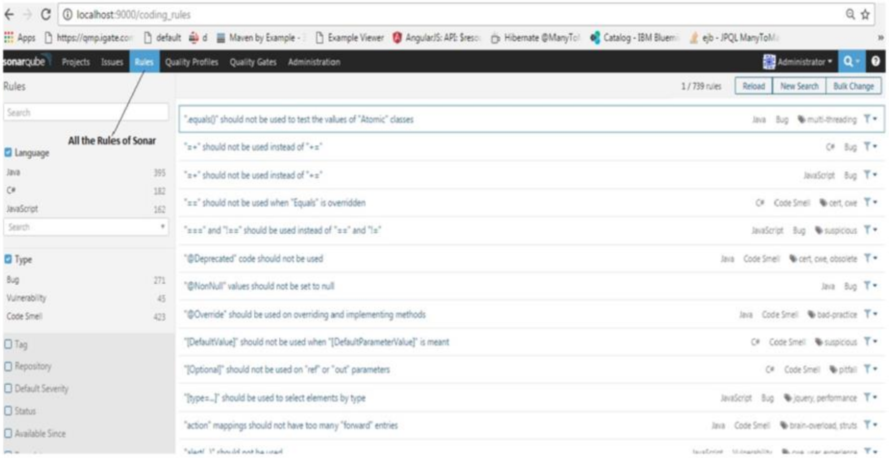
Instructor Notes:

Add instructor notes here.

4.2: Analyzing Java code with Sonar

Analyzing Java with Sonar

- Rules to analyze Java Code



".equals()" should not be used to test the values of "Atomic" classes	Java	Bug	multi-threading
"=+" should not be used instead of "+="	C#	Bug	
"=+" should not be used instead of "+="	JavaScript	Bug	
"==" should not be used when "Equals" is overridden	C#	Code Smell	cert, cwe
"===" and "!==" should be used instead of "==" and "!="	JavaScript	Bug	suspicious
"@Deprecated" code should not be used	Java	Code Smell	cert, cwe, obsolete
"@NonNull" values should not be set to null	Java	Bug	
"@Override" should be used on overriding and implementing methods	Java	Code Smell	bad-practice
"[DefaultValue]" should not be used when "[DefaultParameterValue]" is meant	C#	Code Smell	suspicious
"[Optional]" should not be used on "ref" or "out" parameters	C#	Code Smell	pitfall
"[type=...]" should be used to select elements by type	JavaScript	Bug	jquery, performance
"action" mappings should not have too many "forward" entries	Java	Code Smell	brain-overload, struts
"alert(...)" should not be used	JavaScript	Vulnerability	cwe, user-experience

17

Click on the top "Rules" menu item to enter the world of rules. By default, you will see all the available rules, with the ability to narrow the selection based on search criteria in the left pane:
Language: the language to which a rule applies.
Type: Bug, Vulnerability or Code Smell rules
Tag: it is possible to add tags to rules in order to classify them and to help discover them more easily.
Repository: the engine that contributes rules to SonarQube.
Default Severity: the original severity of the rule - as defined by the plugin that contributes this rule.
Status: rules can have 3 different statuses:

> **Beta:** The rule has been recently implemented and we haven't gotten enough feedback from users yet, so there may be false positives or false negatives.
> **Deprecated:** The rule should no longer be used because a similar, but more powerful and accurate rule exists.
> **Ready:** The rule is ready to be used in production.

Available Since: date when a rule was first added on the SonarQube instance. This is useful to list all the new rules since the last upgrade of a plugin for instance.
Template: display rule templates that allow to create custom rules (see later on this page).
Quality Profile: inclusion in or exclusion from a specific profile
To see the details of a rule, either click on it, or use the right arrow key. Along with basic rule data, you'll also be able to see which, if any, profiles it's active in and how many open issues have been raised with it.
The 2 following actions are available only if you have the right permissions ("Administer Quality Profiles and Gates"):
Add/Remove Tags:

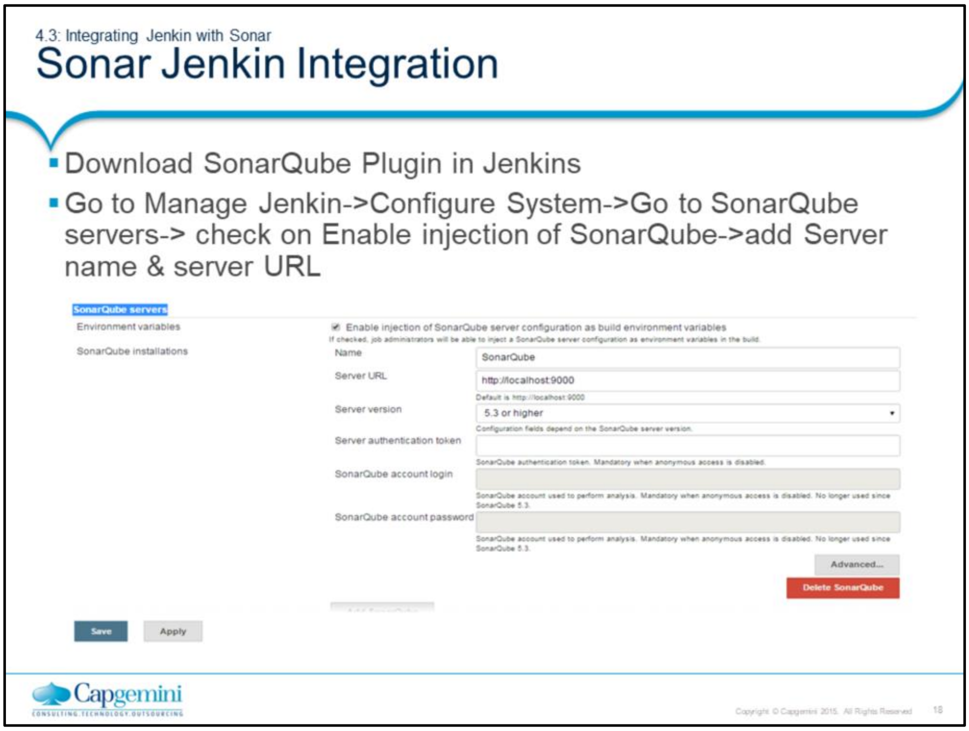
> It is possible to add existing tags on a rule, or to create new ones (just enter a new name while typing in the text field).
> Note that some rules have built-in tags that you cannot remove - they are provided by the plugins which contribute the rules.

Extend Description:

> Extending rule descriptions is useful to let users know how your organization is using a particular rule for instance or to give more insight on a rule.
> Note that the extension will be available to non-admin users as a normal part of the rule details.

Instructor Notes:

Add instructor notes here.



4.3: Integrating Jenkin with Sonar

Sonar Jenkin Integration

- Download SonarQube Plugin in Jenkins
- Go to Manage Jenkin->Configure System->Go to SonarQube servers-> check on Enable injection of SonarQube->add Server name & server URL

SonarQube servers

Environment variables

☑ Enable injection of SonarQube server configuration as build environment variables

If checked, job administrators will be able to inject a SonarQube server configuration as environment variables in the build.

SonarQube installations

Name: SonarQube

Server URL: http://localhost:9000

Default is http://localhost:9000

Server version: 5.3 or higher

Configuration fields depend on the SonarQube server version.

Server authentication token:

SonarQube authentication token. Mandatory when anonymous access is disabled.

SonarQube account login:

SonarQube account used to perform analysis. Mandatory when anonymous access is disabled. No longer used since SonarQube 5.3.

SonarQube account password:

SonarQube account used to perform analysis. Mandatory when anonymous access is disabled. No longer used since SonarQube 5.3.

18

Click on the top "Rules" menu item to enter the world of rules. By default, you will see all the available rules, with the ability to narrow the selection based on search criteria in the left pane:
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Status: rules can have 3 different statuses:

> **Beta:** The rule has been recently implemented and we haven't gotten enough feedback from users yet, so there may be false positives or false negatives.
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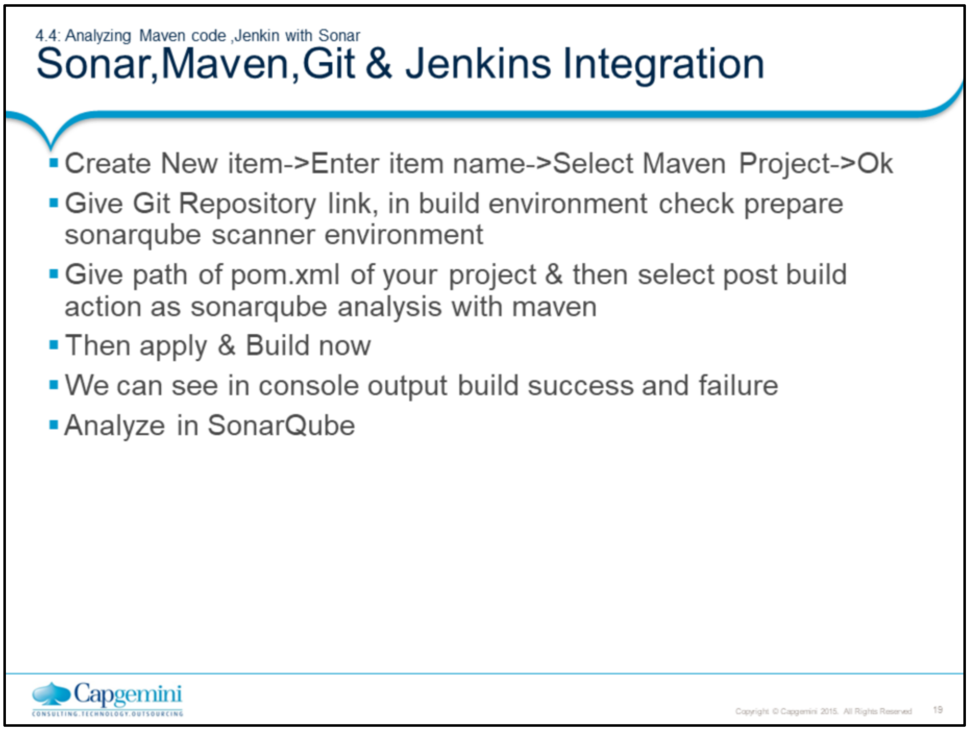

4.4: Analyzing Maven code ,Jenkin with Sonar

Sonar,Maven,Git & Jenkins Integration

- Create New item->Enter item name->Select Maven Project->Ok
- Give Git Repository link, in build environment check prepare sonarqube scanner environment
- Give path of pom.xml of your project & then select post build action as sonarqube analysis with maven
- Then apply & Build now
- We can see in console output build success and failure
- Analyze in SonarQube

Click on the top "Rules" menu item to enter the world of rules. By default, you will see all the available rules, with the ability to narrow the selection based on search criteria in the left pane:
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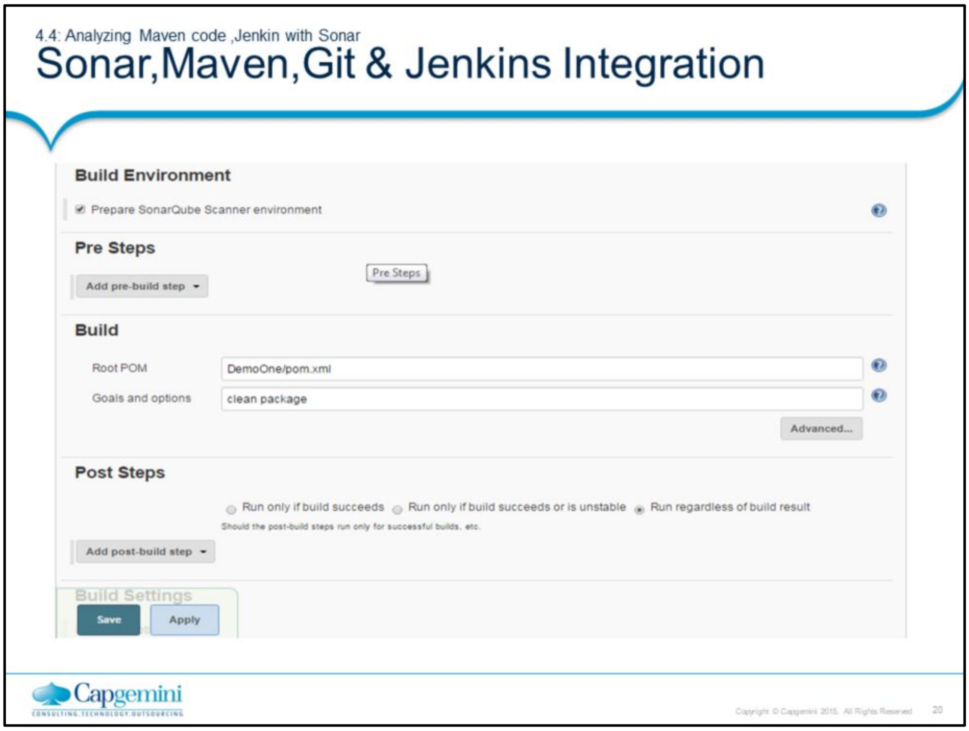
Instructor Notes:

Give Demo example



4.4: Analyzing Maven code ,Jenkin with Sonar

Sonar,Maven,Git & Jenkins Integration

Build Environment

☑ Prepare SonarQube Scanner environment

Pre Steps

Add pre-build step ▾

Build

Root POM: DemoOne/pom.xml

Goals and options: clean package

Advanced...

Post Steps

○ Run only if build succeeds ○ Run only if build succeeds or is unstable ● Run regardless of build result

Should the post-build steps run only for successful builds, etc.

Add post-build step ▾

Build Settings

Save Apply

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Give Demo example

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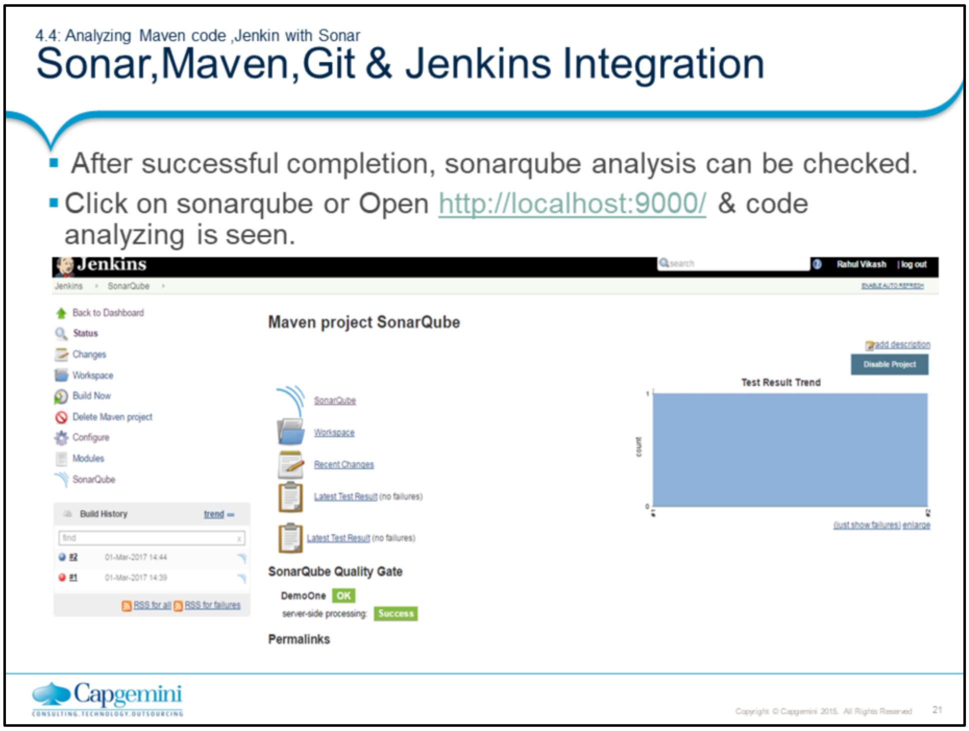

4.4: Analyzing Maven code ,Jenkin with Sonar

Sonar,Maven,Git & Jenkins Integration

- After successful completion, sonarqube analysis can be checked.
- Click on sonarqube or Open http://localhost:9000/ & code analyzing is seen.

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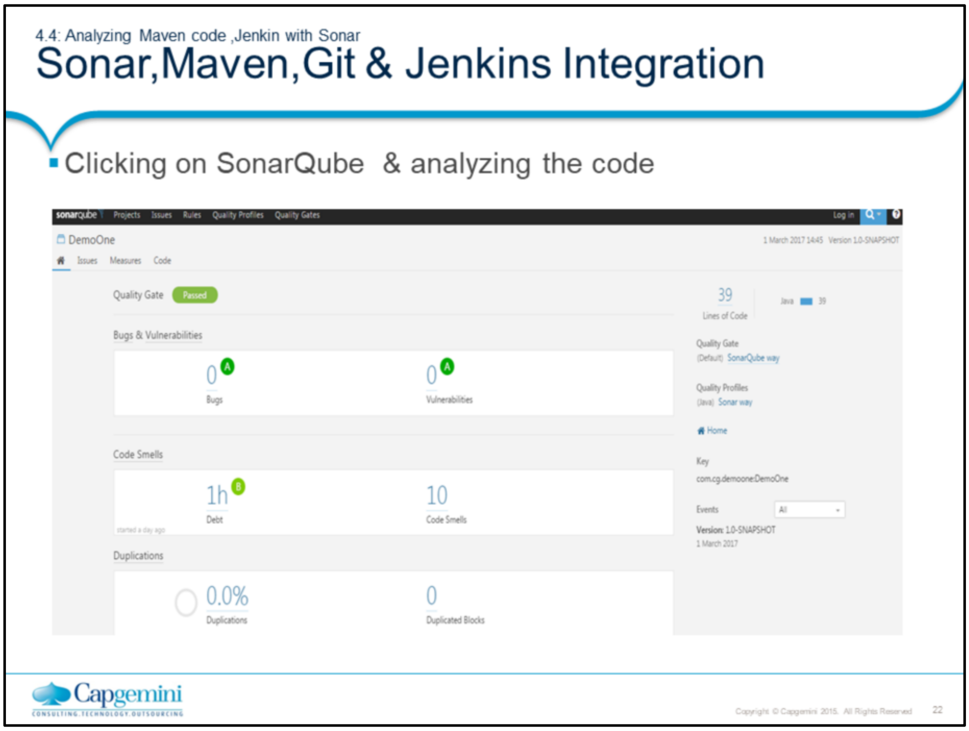
Give Demo example



4.4: Analyzing Maven code ,Jenkin with Sonar

Sonar,Maven,Git & Jenkins Integration

- Clicking on SonarQube & analyzing the code

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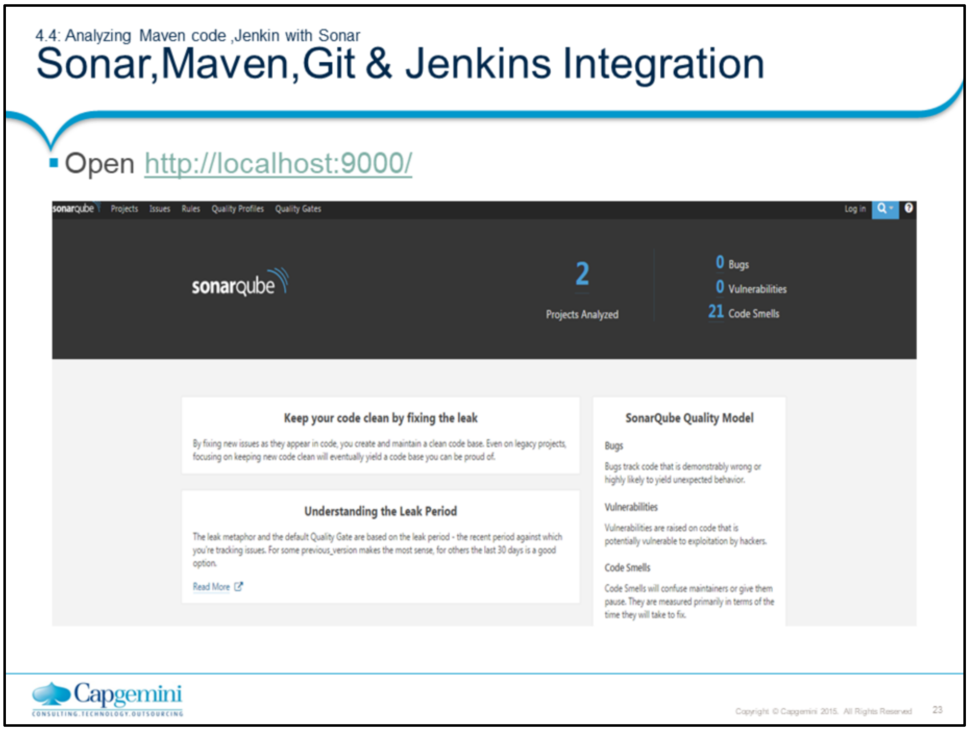

4.4: Analyzing Maven code ,Jenkin with Sonar

Sonar,Maven,Git & Jenkins Integration

- Open http://localhost:9000/

Keep your code clean by fixing the leak

By fixing new issues as they appear in code, you create and maintain a clean code base. Even on legacy projects, focusing on keeping new code clean will eventually yield a code base you can be proud of.

Understanding the Leak Period

The leak metaphor and the default Quality Gate are based on the leak period - the recent period against which you're tracking issues. For some previous_version makes the most sense, for others the last 30 days is a good option.

Read More

SonarQube Quality Model

Bugs

Bugs track code that is demonstrably wrong or highly likely to yield unexpected behavior.

Vulnerabilities

Vulnerabilities are raised on code that is potentially vulnerable to exploitation by hackers.

Code Smells

Code Smells will confuse maintainers or give them pause. They are measured primarily in terms of the time they will take to fix.

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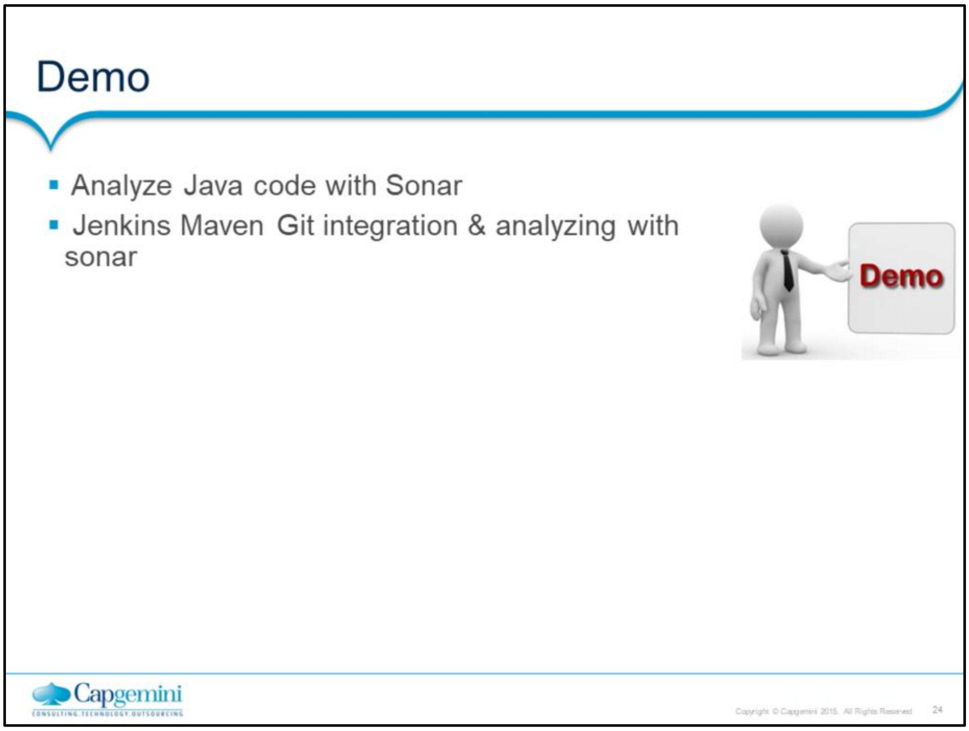

Demo

- Analyze Java code with Sonar
- Jenkins Maven Git integration & analyzing with sonar

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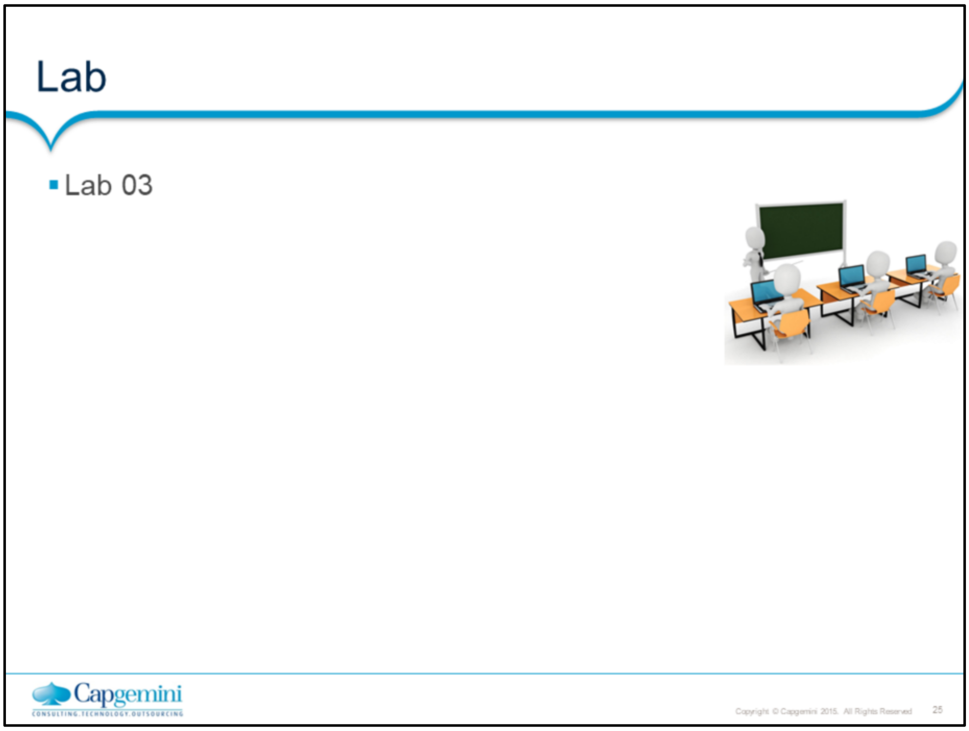
Add the notes here.

Instructor Notes:

Add instructor notes here.



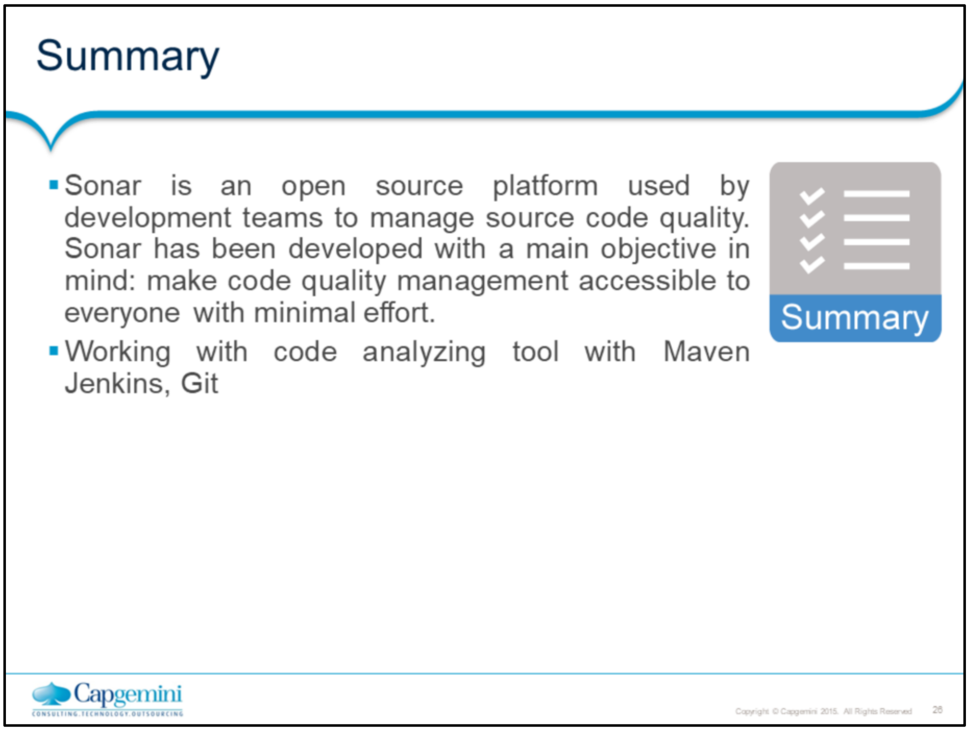
Lab

- Lab 03

Add the notes here.

Instructor Notes:

Add instructor notes here.



Summary

- Sonar is an open source platform used by development teams to manage source code quality. Sonar has been developed with a main objective in mind: make code quality management accessible to everyone with minimal effort.
- Working with code analyzing tool with Maven Jenkins, Git

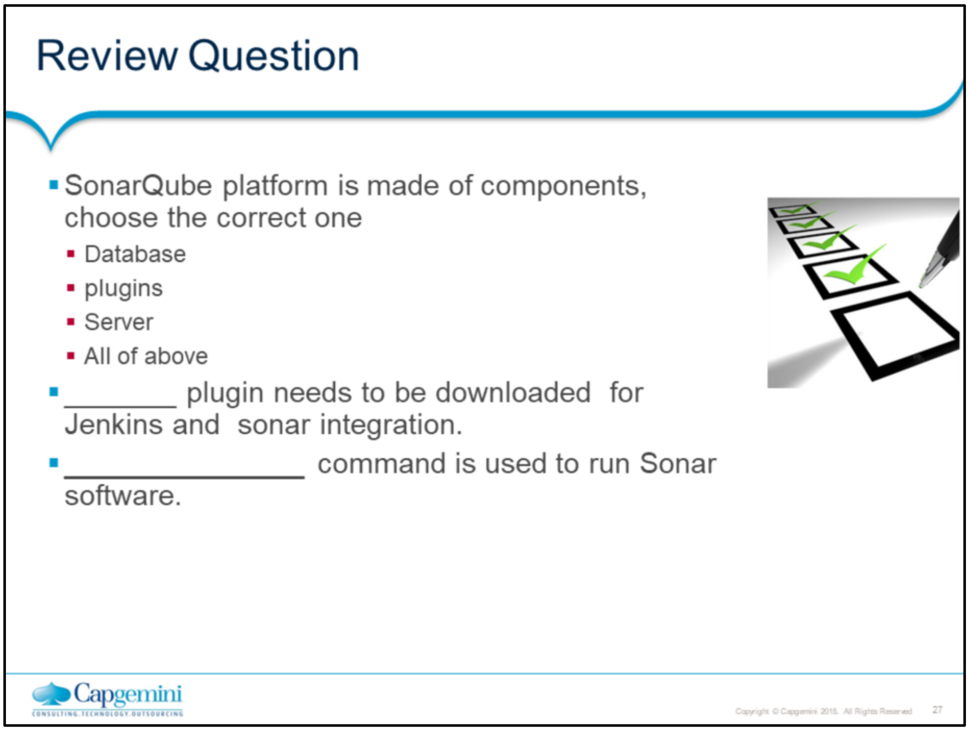
Add the notes here.

Instructor Notes:

Q1.All of above.

Q2. Sonarqube

Q3StartSonar.bat



Review Question

- SonarQube platform is made of components, choose the correct one
  - Database
  - plugins
  - Server
  - All of above
- ________ plugin needs to be downloaded for Jenkins and sonar integration.
- _______________ command is used to run Sonar software.

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Add the notes here.