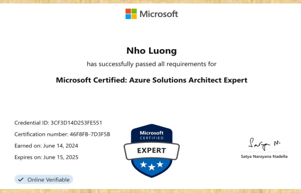
Managing Technical Debt with SonarQube

DevOps with GitHub & Azure

Author: Nho Luong

Skill: DevOps Engineer Lead



Microsoft

Nho Luong

has successfully passed all requirements for

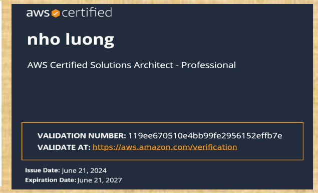
Microsoft Certified: Azure Solutions Architect Expert

Credential ID: 3CF3D14D253FE551
Certification number: 46F8FB-7D3F5B
Earned on: June 14, 2024
Expires on: June 15, 2025

✓ Online Verifiable

Satya Narayana Nadella

Microsoft CERTIFIED
EXPERT



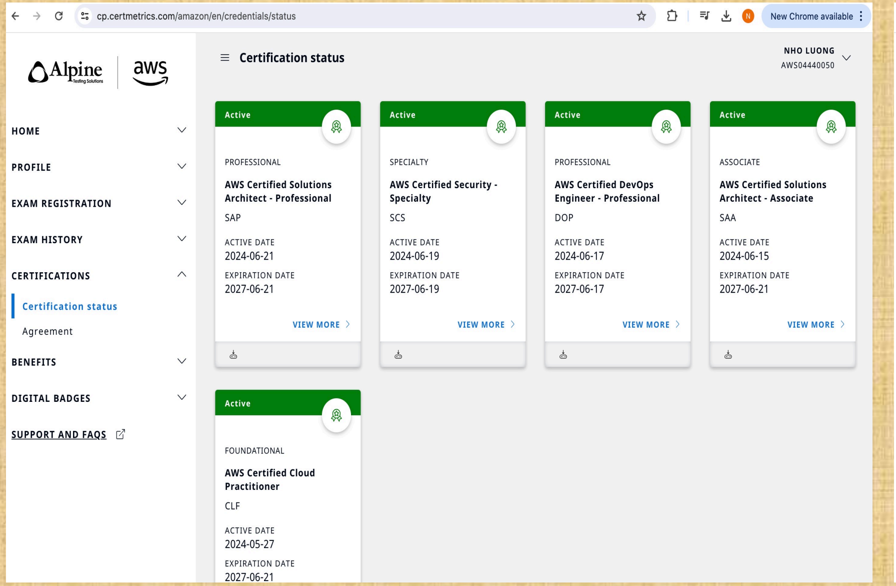
aws certified

nho luong

AWS Certified Solutions Architect - Professional

VALIDATION NUMBER: 119ee670510e4bb99fe2956152effb7e
VALIDATE AT: https://aws.amazon.com/verification

Issue Date: June 21, 2024
Expiration Date: June 21, 2027



cp.certmetrics.com/amazon/en/credentials/status

Certification status

NHO LUONG
AWS04440050

Active
PROFESSIONAL
AWS Certified Solutions Architect - Professional
SAP
ACTIVE DATE
2024-06-21
EXPIRATION DATE
2027-06-21
VIEW MORE

Active
SPECIALTY
AWS Certified Security - Specialty
SCS
ACTIVE DATE
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AWS Certified Solutions Architect - Associate
SAA
ACTIVE DATE
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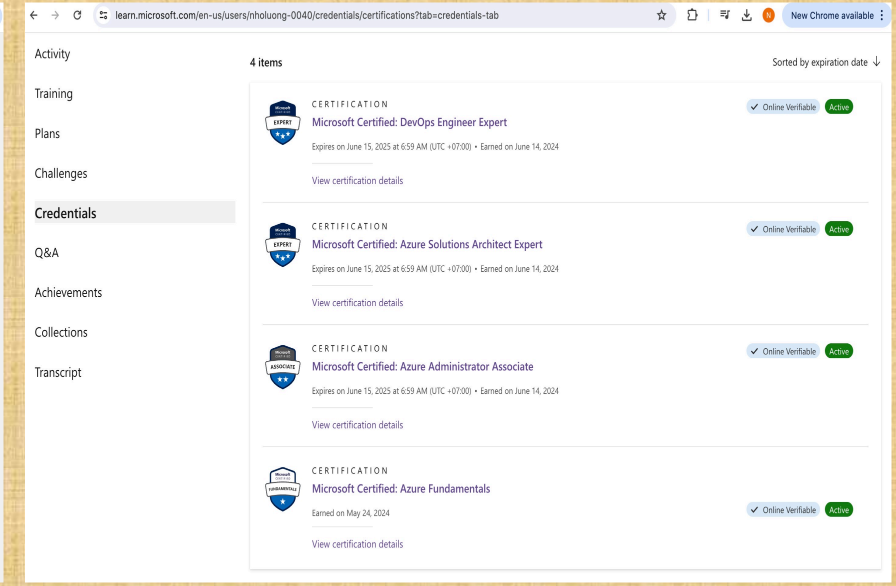
2027-06-21
VIEW MORE

Active
FOUNDATIONAL
AWS Certified Cloud Practitioner
CLF
ACTIVE DATE
2024-05-27
EXPIRATION DATE
2027-06-21



learn.microsoft.com/en-us/users/nholuong-0040/credentials/certifications?tab=credentials-tab

4 items

Sorted by expiration date ↓

CERTIFICATION
Microsoft Certified: DevOps Engineer Expert
Expires on June 15, 2025 at 6:59 AM (UTC +07:00) • Earned on June 14, 2024
View certification details
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CERTIFICATION
Microsoft Certified: Azure Solutions Architect Expert
Expires on June 15, 2025 at 6:59 AM (UTC +07:00) • Earned on June 14, 2024
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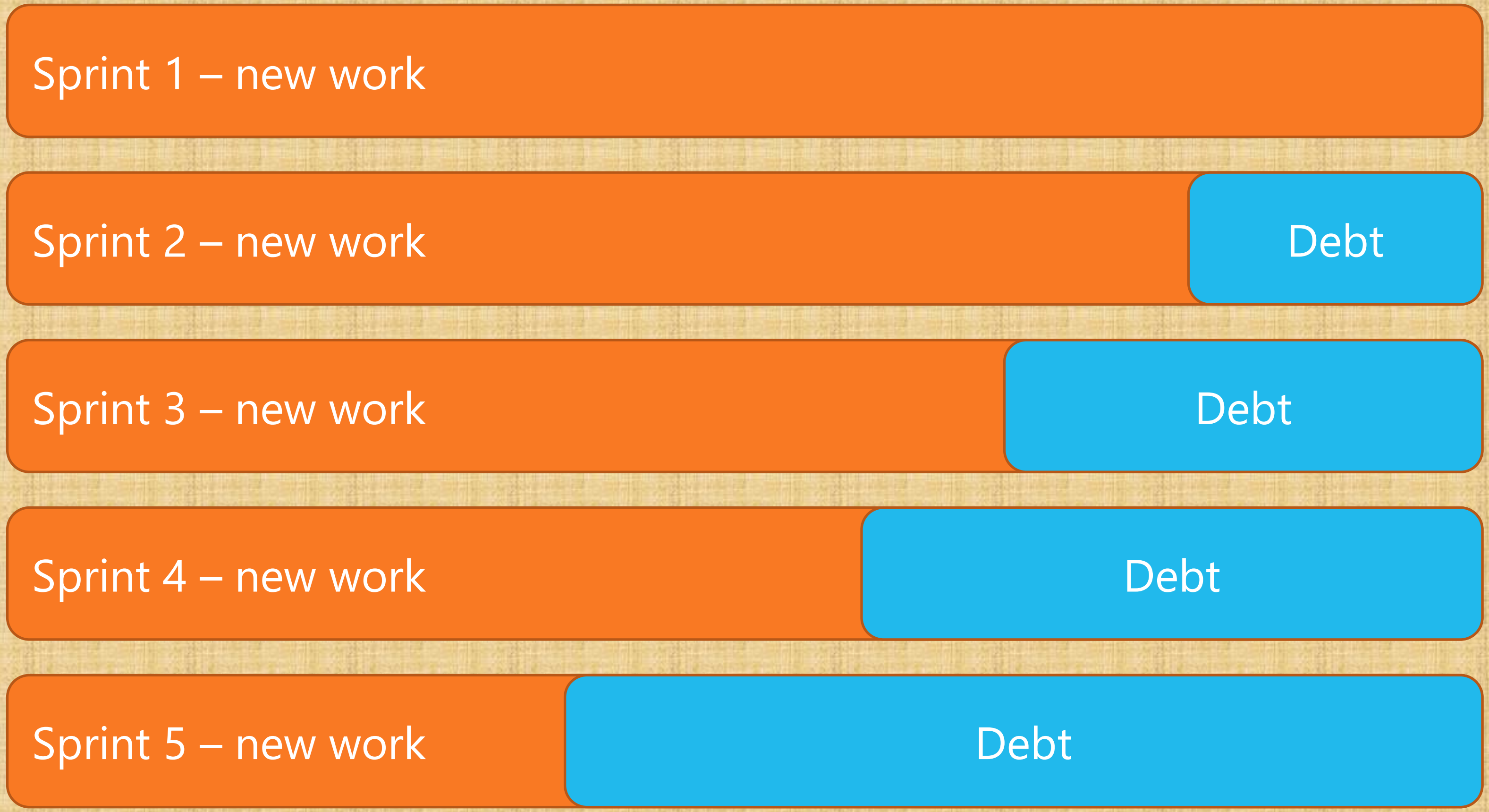
CERTIFICATION
Microsoft Certified: Azure Administrator Associate
Expires on June 15, 2025 at 6:59 AM (UTC +07:00) • Earned on June 14, 2024
View certification details
✓ Online Verifiable Active

CERTIFICATION
Microsoft Certified: Azure Fundamentals
Earned on May 24, 2024
View certification details
✓ Online Verifiable Active

What is technical debt?

Author: Nho Luong
Skill: DevOps Engineer Lead

Technical Debt means you get less done as a code base ages



Sprint 1 – new work

Sprint 2 – new work Debt

Sprint 3 – new work Debt

Sprint 4 – new work Debt

Sprint 5 – new work Debt

Author: Nho Luong
Skill: DevOps Engineer Lead

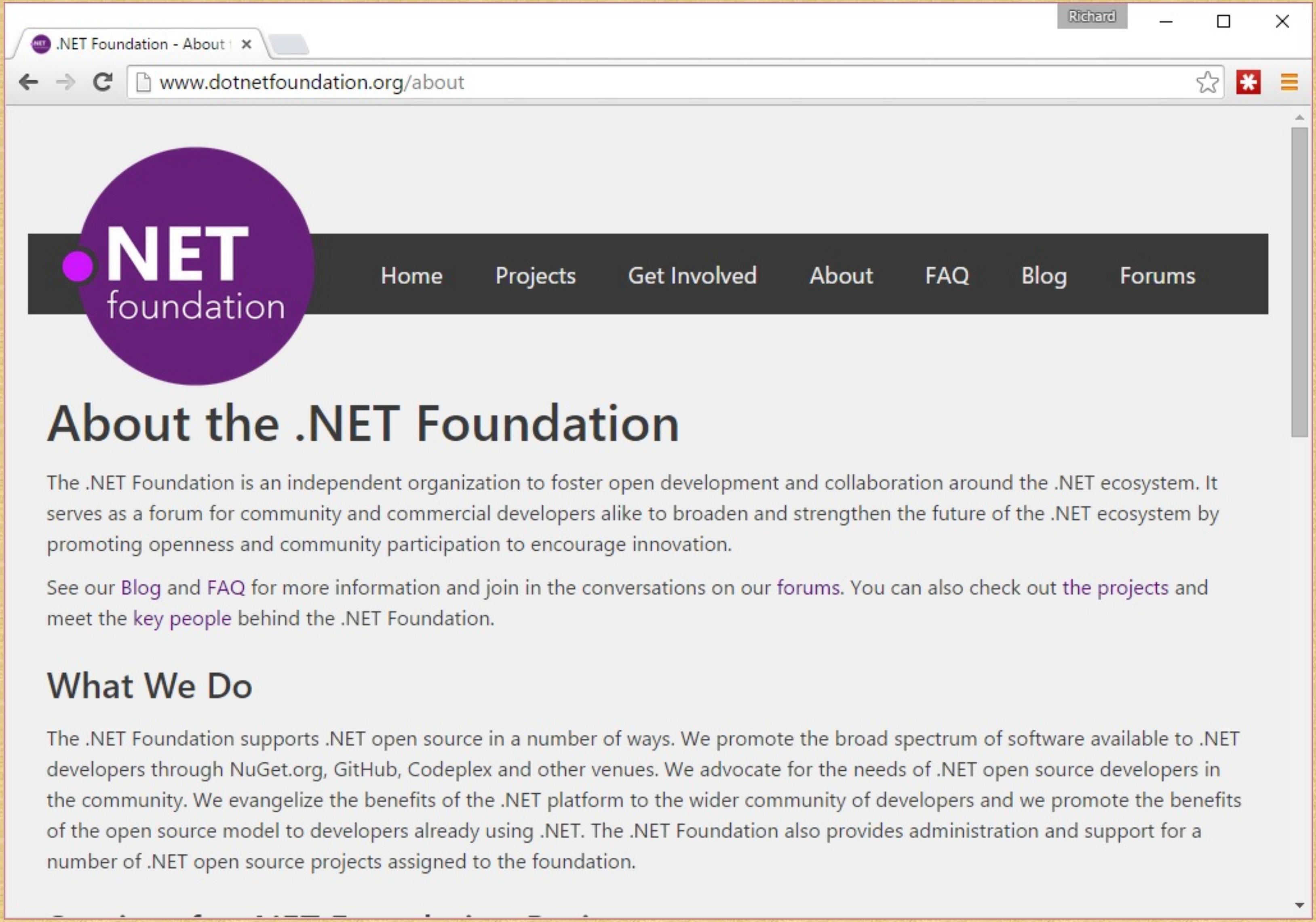
What tools do we have in Microsoft land?

- Compiler Errors/Warnings
- FXCop/Code Analysis
- StyleCop
- Unit Test Coverage
- Numerous other tools….

- But they are snapshots in time, we need a better dashboard

Author: Nho Luong
Skill: DevOps Engineer Lead

This is not your grandfather's Microsoft



About the .NET Foundation

The .NET Foundation is an independent organization to foster open development and collaboration around the .NET ecosystem. It serves as a forum for community and commercial developers alike to broaden and strengthen the future of the .NET ecosystem by promoting openness and community participation to encourage innovation.

See our Blog and FAQ for more information and join in the conversations on our forums. You can also check out the projects and meet the key people behind the .NET Foundation.

What We Do

The .NET Foundation supports .NET open source in a number of ways. We promote the broad spectrum of software available to .NET developers through NuGet.org, GitHub, Codeplex and other venues. We advocate for the needs of .NET open source developers in the community. We evangelize the benefits of the .NET platform to the wider community of developers and we promote the benefits of the open source model to developers already using .NET. The .NET Foundation also provides administration and support for a number of .NET open source projects assigned to the foundation.

Microsoft staff in 1978

Author: Nho Luong
Skill: DevOps Engineer Lead

Introducting SonarQube

To quote the product homepage…

“The SonarQube® platform is an open source quality management platform, dedicated to continuously analyzing and measuring the technical quality of source code, from project portfolio down to the method level. To understand what the platform tracks and why it's important, take a look at the Developers' Seven Deadly Sins.”

sonarqube

Author: Nho Luong
Skill: DevOps Engineer Lead

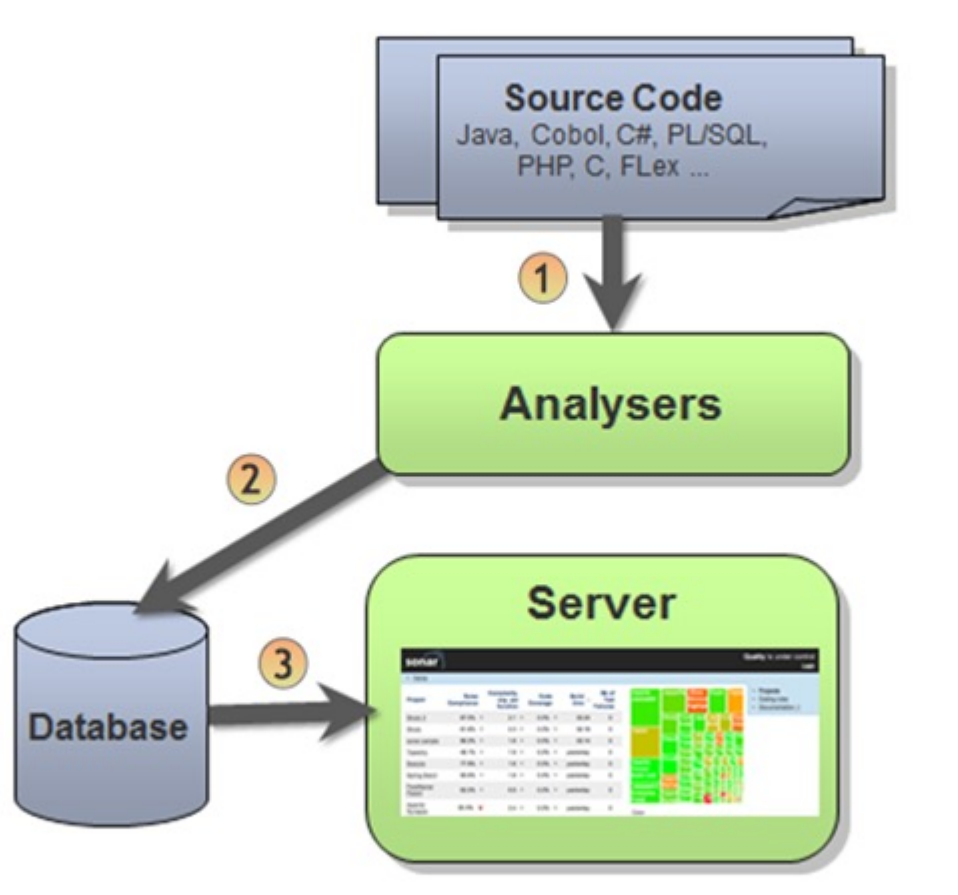
SonarQube Architecture

- **SonarQube Scanner Command-line**
  Tool to analyze source code

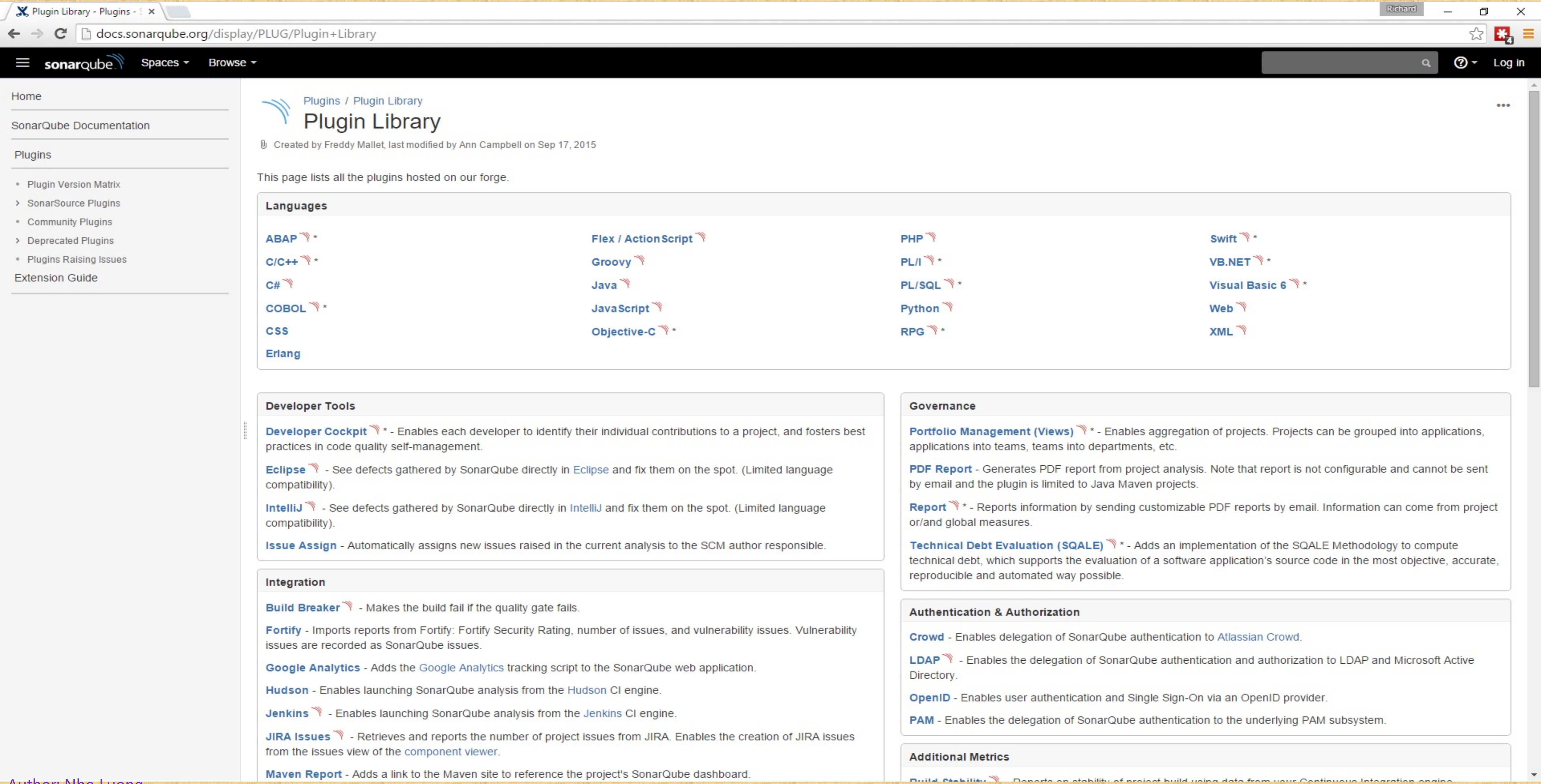
- **SonarQube Scanner for Maven**
  Integrate source code analysis to Apache Maven builds

- **SonarQube Scanner for MSBuild**
  Integrate source code analysis to any .Net projects

- **SonarQube Scanner for Ant**
  Integrate source code analysis to Apache Ant builds



Author: Nho Luong
Skill: DevOps Engineer Lead



Plugins / Plugin Library

Plugin Library

Created by Freddy Mallet, last modified by Ann Campbell on Sep 17, 2015

This page lists all the plugins hosted on our forge.

Languages

ABAP *
C/C++ *
C#
COBOL *
CSS
Erlang
Flex / ActionScript
Groovy
Java
JavaScript
Objective-C *
PHP
PL/I *
PL/SQL *
Python
RPG *
Swift *
VB.NET *
Visual Basic 6 *
Web
XML

Developer Tools

Developer Cockpit * - Enables each developer to identify their individual contributions to a project, and fosters best practices in code quality self-management.

Eclipse - See defects gathered by SonarQube directly in Eclipse and fix them on the spot. (Limited language compatibility).

IntelliJ - See defects gathered by SonarQube directly in IntelliJ and fix them on the spot. (Limited language compatibility).

Issue Assign - Automatically assigns new issues raised in the current analysis to the SCM author responsible.

Integration

Build Breaker - Makes the build fail if the quality gate fails.

Fortify - Imports reports from Fortify: Fortify Security Rating, number of issues, and vulnerability issues. Vulnerability issues are recorded as SonarQube issues.

Google Analytics - Adds the Google Analytics tracking script to the SonarQube web application.

Hudson - Enables launching SonarQube analysis from the Hudson CI engine.

Jenkins - Enables launching SonarQube analysis from the Jenkins CI engine.

JIRA Issues - Retrieves and reports the number of project issues from JIRA. Enables the creation of JIRA issues from the issues view of the component viewer.

Maven Report - Adds a link to the Maven site to reference the project's SonarQube dashboard.

Governance

Portfolio Management (Views) * - Enables aggregation of projects. Projects can be grouped into applications, applications into teams, teams into departments, etc.

PDF Report - Generates PDF report from project analysis. Note that report is not configurable and cannot be sent by email and the plugin is limited to Java Maven projects.

Report * - Reports information by sending customizable PDF reports by email. Information can come from project or/and global measures.

Technical Debt Evaluation (SQALE) * - Adds an implementation of the SQALE Methodology to compute technical debt, which supports the evaluation of a software application's source code in the most objective, accurate, reproducible and automated way possible.

Authentication & Authorization

Crowd - Enables delegation of SonarQube authentication to Atlassian Crowd.

LDAP - Enables the delegation of SonarQube authentication and authorization to LDAP and Microsoft Active Directory.

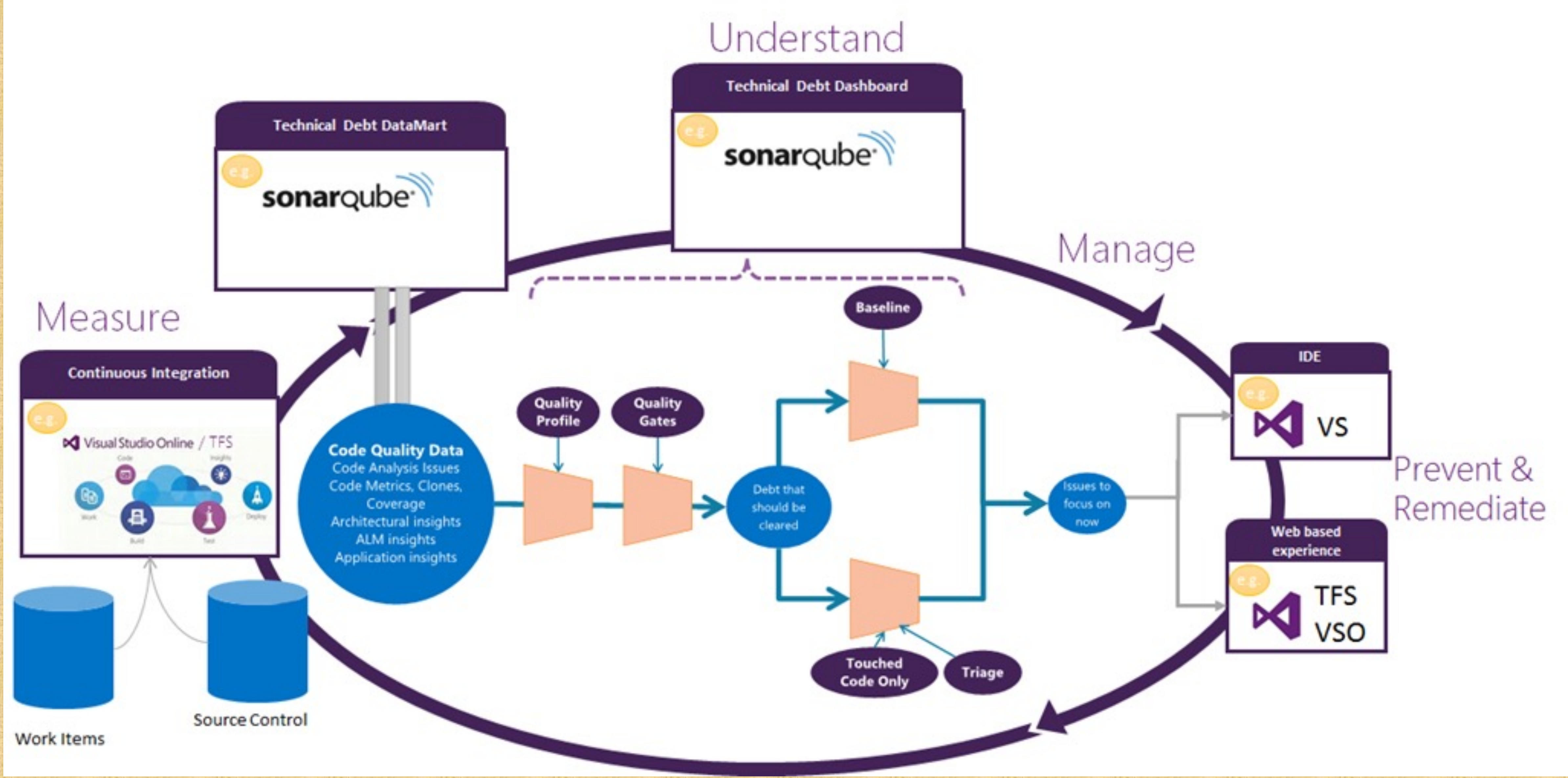
OpenID - Enables user authentication and Single Sign-On via an OpenID provider.

PAM - Enables the delegation of SonarQube authentication to the underlying PAM subsystem.

Additional Metrics

Build Stability - Reports on stability of project build using data from your Continuous Integration engine.

Author: Nho Luong
Skill: DevOps Engineer Lead

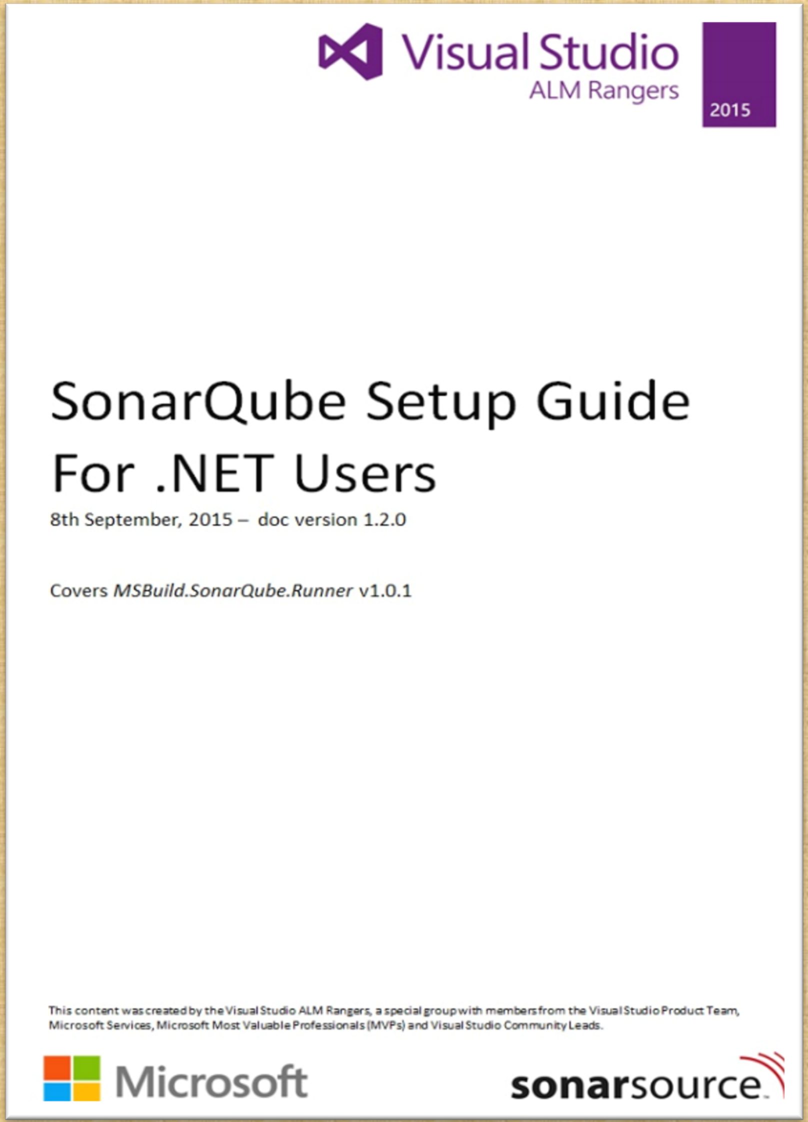


Author: Nho Luong
Skill: DevOps Engineer Lead

Setup of SonarQube

Has a few gotcha's so

- See the ALM Rangers Guide
  https://github.com/SonarSource/sonar-.net-documentation
- Also see SonarQube site
  http://docs.sonarqube.org/display/SONAR/Setup+and+Upgrade



Visual Studio
ALM Rangers
2015

SonarQube Setup Guide
For .NET Users

8th September, 2015 – doc version 1.2.0

Covers *MSBuild.SonarQube.Runner* v1.0.1

This content was created by the Visual Studio ALM Rangers, a special group with members from the Visual Studio Product Team, Microsoft Services, Microsoft Most Valuable Professionals (MVPs) and Visual Studio Community Leads.

Microsoft sonarsource

Author: Nho Luong
Skill: DevOps Engineer Lead

Installation – Server Requirements

- A VM
  - 1 Gb of memory
  - Can be Windows or Linux
  - .NET 4.5.2 (for the MSBuild Runner)
- Java
  - Oracle JRE 7 (or greater)
  - OpenJDK 7 (or greater)
- Database
  - H2 (for demo only)
  - Microsoft SQL Server 2008 or later
  - Oracle 10G/11G with Oracle 11.2x drivers
  - MySQL 5.1 (or greater)
- Web Browser
  - IE 9+
  - And all other current browsers

Installation – Setup Microsoft SQL

- You need a real DB – but SQL Express is enough
- Beware the JDBC drivers, from my experience
  - They are not fond of clustering
  - Or of integrated Windows security
  - DB names are case sensitive
- Collation <u>must</u> be set to case-sensitive (CS) and accent-sensitive (AS) e.g. SQL_Latin1_General_CP1_CI_AS
- Process
  - Create and empty DB
  - Create a user and grant rights as owner of the empty DB
  - Remember the values as they need to go in a various config files
  - Open port 1433 in the SQL server firewall

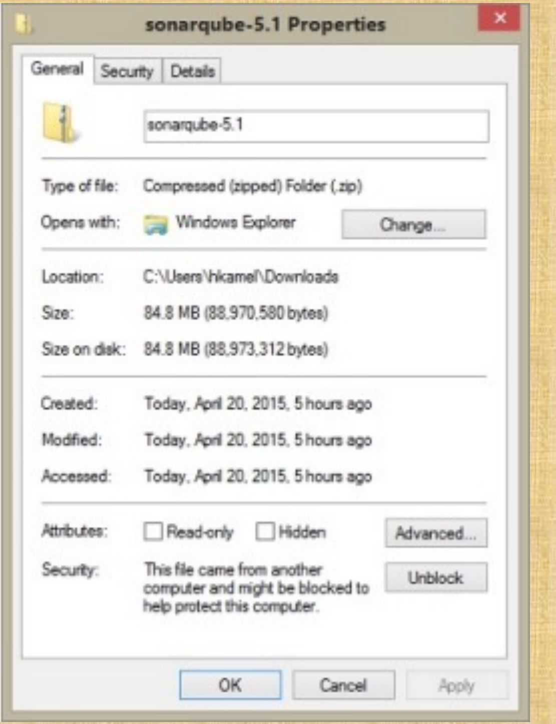
Installation – SonarQube Server

- Install the JRE
- Download **sonarqube-5.x.zip**
- Make sure the ZIP is unblocked
- Unzip it to a folder e.g: **C:\sonarqube**
- Edit **C:\sonarqube\conf\sonar.properties** to set the connection string and authentication

```
sonar.jdbc.username=sonaruser
sonar.jdbc.password=Pass@w0rd1
sonar.jdbc.url=jdbc:jtds:sqlserver://localhost/Sonar;SelectMethod=Cursor
```

(There is more settings you can edit, but these should be enough)

- Open port 9000 in the server firewall



sonarqube-5.1 Properties

sonarqube-5.1

Type of file: Compressed (zipped) Folder (.zip)

Opens with: Windows Explorer

Location: C:\Users\hkamel\Downloads

Size: 84.8 MB (88,970,580 bytes)

Size on disk: 84.8 MB (88,973,312 bytes)

Created: Today, April 20, 2015, 5 hours ago

Modified: Today, April 20, 2015, 5 hours ago

Accessed: Today, April 20, 2015, 5 hours ago

Attributes: □ Read-only □ Hidden

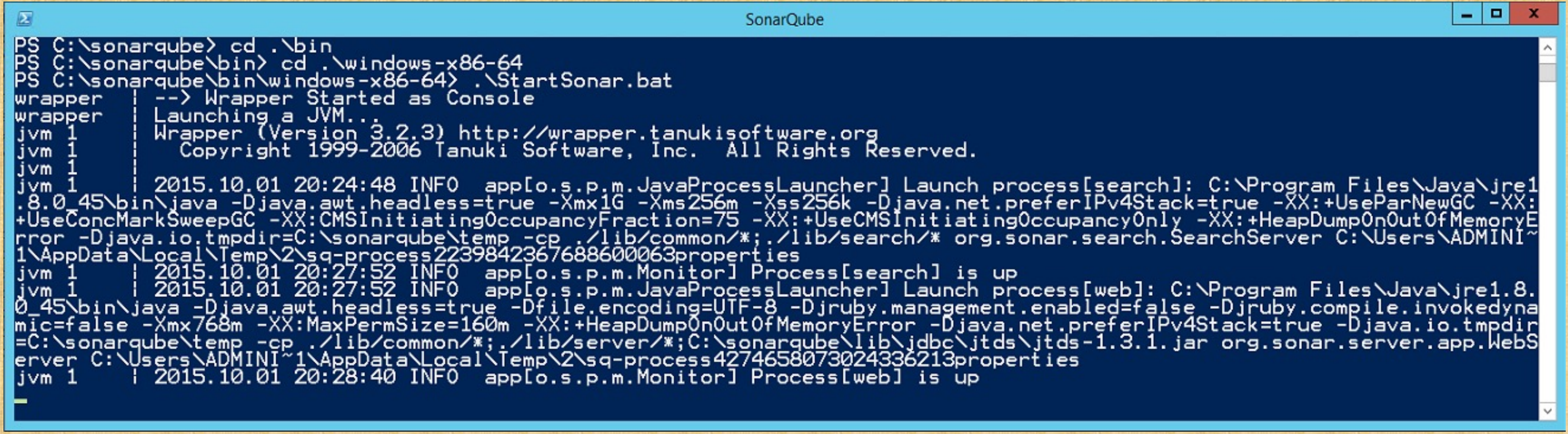
Security: This file came from another computer and might be blocked to help protect this computer.

Installation – Plug-Ins

- Can be installed manual
  - Download the C# Plug-in from SonarQube
  - Make sure the ZIP is unblocked
  - Unzip it
  - Drop the JAR file in **C:\sonarqube\extensions\plugins**
- Or via the SonarQube management UI

Installation – Start the Server

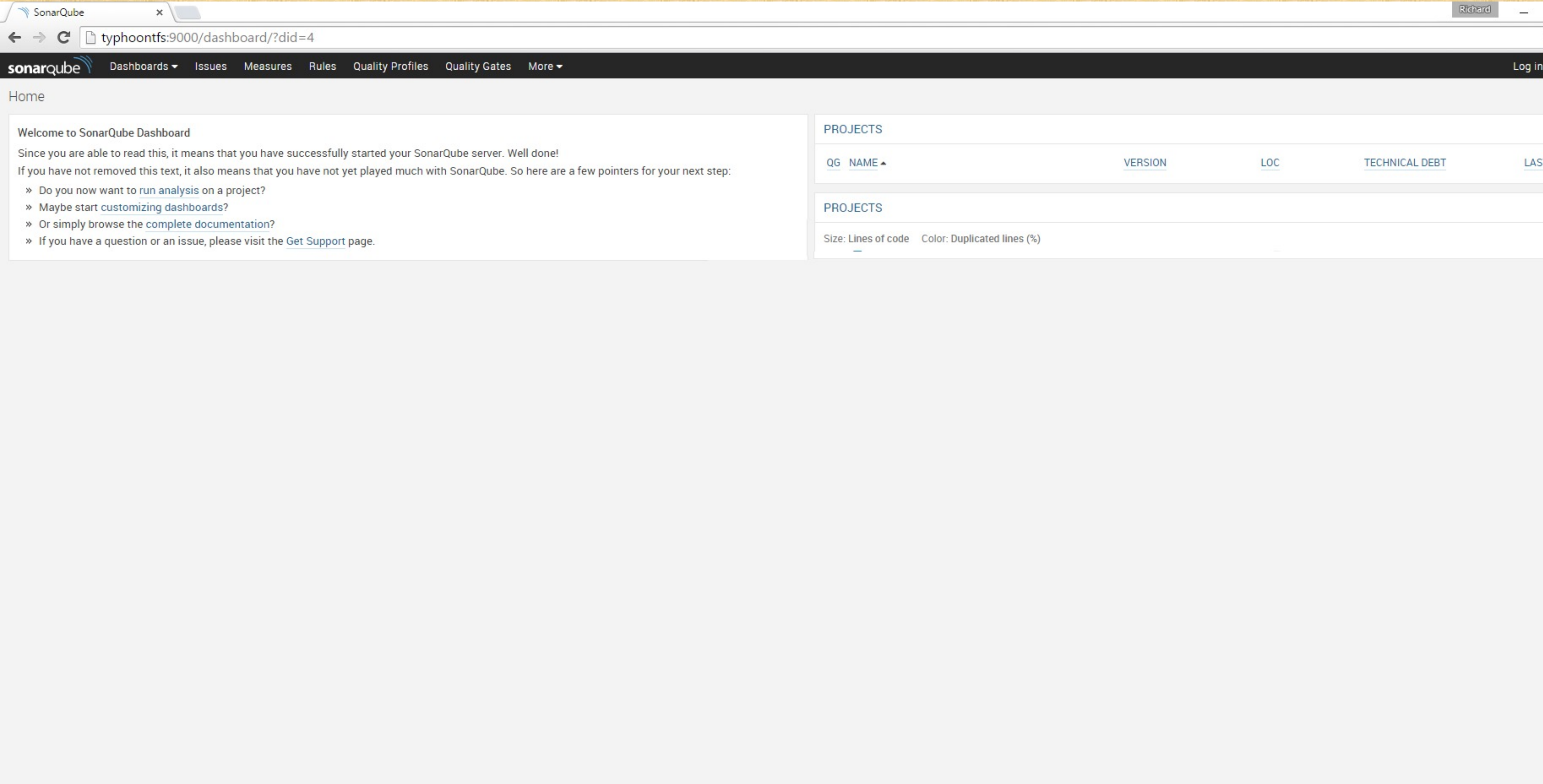
- Use a script from **C:\sonarqube\bin**
- Probably best to start using **.\windows-x86-64\StartSonar.bat**



```
PS C:\sonarqube> cd .\bin
PS C:\sonarqube\bin> cd .\windows-x86-64
PS C:\sonarqube\bin\windows-x86-64> .\StartSonar.bat
wrapper  | --> Wrapper Started as Console
wrapper  | Launching a JVM...
jvm 1    | Wrapper (Version 3.2.3) http://wrapper.tanukisoftware.org
jvm 1    |   Copyright 1999-2006 Tanuki Software, Inc.  All Rights Reserved.
jvm 1    |
jvm 1    | 2015.10.01 20:24:48 INFO  app[o.s.p.m.JavaProcessLauncher] Launch process[search]: C:\Program Files\Java\jre1
.8.0_45\bin\java -Djava.awt.headless=true -Xmx1G -Xms256m -Xss256k -Djava.net.preferIPv4Stack=true -XX:+UseParNewGC -XX:
+UseConcMarkSweepGC -XX:CMSInitiatingOccupancyFraction=75 -XX:+UseCMSInitiatingOccupancyOnly -XX:+HeapDumpOnOutOfMemoryE
rror -Djava.io.tmpdir=C:\sonarqube\temp -cp ./lib/common/*;./lib/search/* org.sonar.search.SearchServer C:\Users\ADMINI~
1\AppData\Local\Temp\2\sq-process2239842367688600063properties
jvm 1    | 2015.10.01 20:27:52 INFO  app[o.s.p.m.Monitor] Process[search] is up
jvm 1    | 2015.10.01 20:27:52 INFO  app[o.s.p.m.JavaProcessLauncher] Launch process[web]: C:\Program Files\Java\jre1.8.
0_45\bin\java -Djava.awt.headless=true -Dfile.encoding=UTF-8 -Djruby.management.enabled=false -Djruby.compile.invokedyna
mic=false -Xmx768m -XX:MaxPermSize=160m -XX:+HeapDumpOnOutOfMemoryError -Djava.net.preferIPv4Stack=true -Djava.io.tmpdir
=C:\sonarqube\temp -cp ./lib/common/*;./lib/server/*;C:\sonarqube\lib\jdbc\jtds\jtds-1.3.1.jar org.sonar.server.app.WebS
erver C:\Users\ADMINI~1\AppData\Local\Temp\2\sq-process4274658073024336213properties
jvm 1    | 2015.10.01 20:28:40 INFO  app[o.s.p.m.Monitor] Process[web] is up
```

- Look in **C:\sonarqube\logs** if you have problems

Author: Nho Luong
Skill: DevOps Engineer Lead



Home

Welcome to SonarQube Dashboard

Since you are able to read this, it means that you have successfully started your SonarQube server. Well done!

If you have not removed this text, it also means that you have not yet played much with SonarQube. So here are a few pointers for your next step:

- Do you now want to run analysis on a project?
- Maybe start customizing dashboards?
- Or simply browse the complete documentation?
- If you have a question or an issue, please visit the Get Support page.

PROJECTS

QG	NAME ▲	VERSION	LOC	TECHNICAL DEBT	LAS

PROJECTS

Size: Lines of code   Color: Duplicated lines (%)

Author: Nho Luong
Skill: DevOps Engineer Lead

Install – The Sonar Runner

- On a PC with the code to analyse
- Download from SonarQube

  http://www.sonarqube.org/downloads/
- Unblock and unzip
- Set the DB connection details in the

  .\Conf\sonar-runner.properties
- Consider adding editing the Windows Path

Analysis from the command line

- Create a **sonar-project.properties** in root of your project

```
# must be unique in a given SonarQube instance
sonar.projectKey=my:project
# this is the name displayed in the SonarQube UI
sonar.projectName=My project
sonar.projectVersion=1.0

# Path is relative to the sonar-project.properties file. Replace "\" by "/" on Windows.
# Since SonarQube 4.2, this property is optional if sonar.modules is set.
# If not set, SonarQube starts looking for source code from the directory containing
# the sonar-project.properties file.
sonar.sources=.

# Encoding of the source code. Default is default system encoding
#sonar.sourceEncoding=UTF-8
```

- Run the batch file **sonar-runner**

http://docs.sonarqube.org/display/SONAR/Analyzing+with+SonarQube+Runner

Run as part of a Build

- Option 1
  - Just use the same command line script
- Option 2
  - Use task/activity appropriate to your Build system
    - ANT
    - Maven
    - MSBUILD

Install – The MSBuild Runner

- This generates the **sonar-project.properties** automatically
- Probably need to install this on a build VM (with a JRE)

- Download from SonarQube

  http://www.sonarqube.org/downloads/
- Unblock and unzip
- Set the DB connection details in **SonarQube.Analysis.xml**

Run from the command line

- You can still manually run the processing

Powershell

```
C:\myproject>
C:\myproject>MSBuild.SonarQube.Runner.exe begin /key:{SonarQube project key} /name:{SQ project name} /version:{SQ project version}
C:\myproject>Msbuild
C:\myproject>MSBuild.SonarQube.Runner.exe end
```

Integration with TFS Build

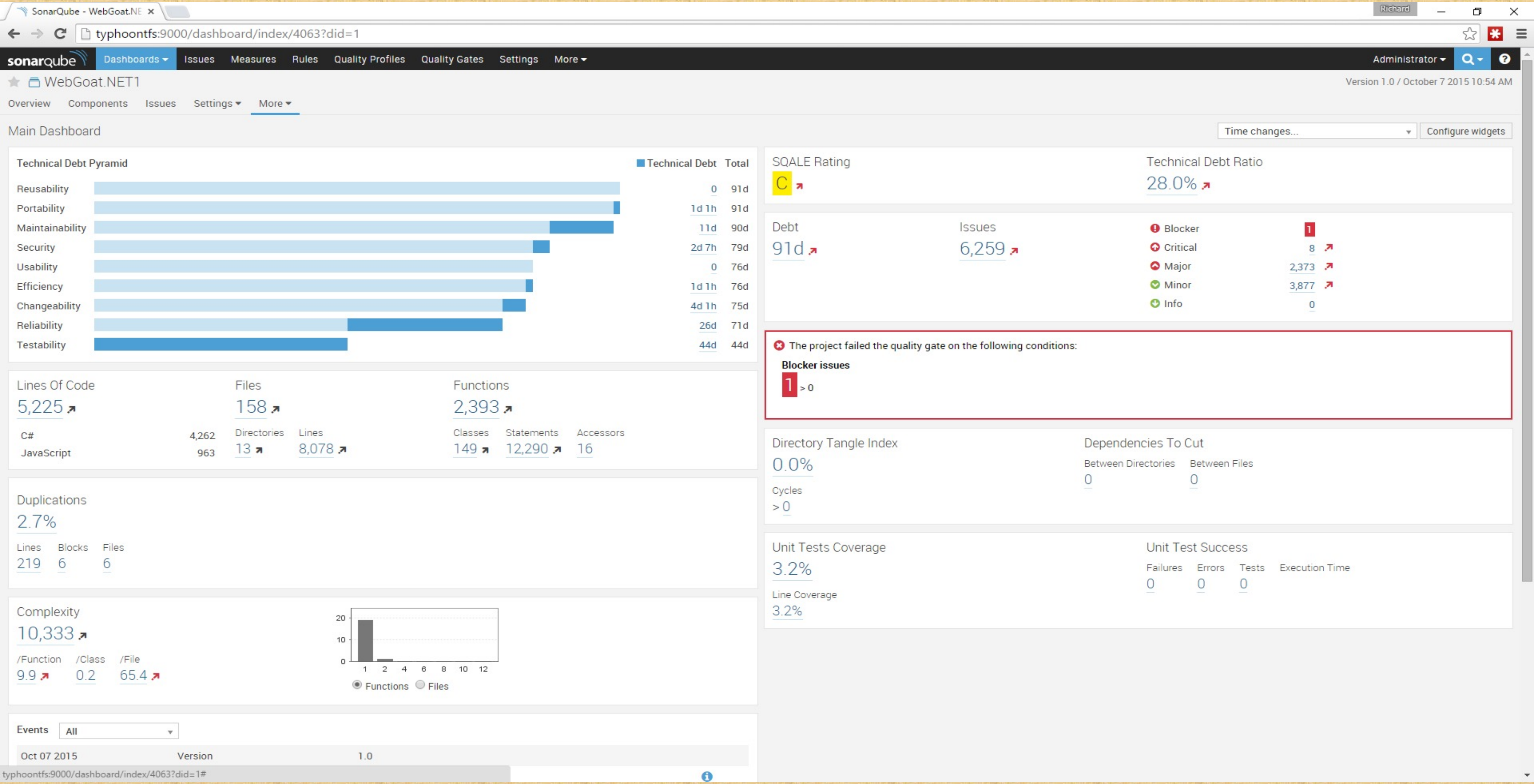
- Option 1
  - Call MSBuild.SonarQube.Runner.exe via pre/post scripts
- Option 2
  - Use a TFS build task (that does the same behind the scenes)

Demo

Build Automation

So what do I see in SonarQube?

- Dashboards
  - Tables and Charts
  - Trends over time
  - Base-lines based on version
- Technical Debt time estimates
- Quality Ratings
- Quality Gates



WebGoat.NET1

Version 1.0 / October 7 2015 10:54 AM

Main Dashboard

Technical Debt Pyramid

	Technical Debt	Total
Reusability	0	91d
Portability	1d 1h	91d
Maintainability	11d	90d
Security	2d 7h	79d
Usability	0	76d
Efficiency	1d 1h	76d
Changeability	4d 1h	75d
Reliability	26d	71d
Testability	44d	44d

SQALE Rating
C

Technical Debt Ratio
28.0%

Debt
91d

Issues
6,259

Blocker	1
Critical	8
Major	2,373
Minor	3,877
Info	0

The project failed the quality gate on the following conditions:

Blocker issues
1 > 0

Lines Of Code
5,225

C#	4,262
JavaScript	963

Files
158

Directories
13

Lines
8,078

Functions
2,393

Classes
149

Statements
12,290

Accessors
16

Directory Tangle Index
0.0%

Cycles
> 0

Dependencies To Cut

Between Directories
0

Between Files
0

Duplications
2.7%

Lines	Blocks	Files
219	6	6

Unit Tests Coverage
3.2%

Line Coverage
3.2%

Unit Test Success

Failures	Errors	Tests	Execution Time
0	0	0	

Complexity
10,333

/Function	/Class	/File
9.9	0.2	65.4

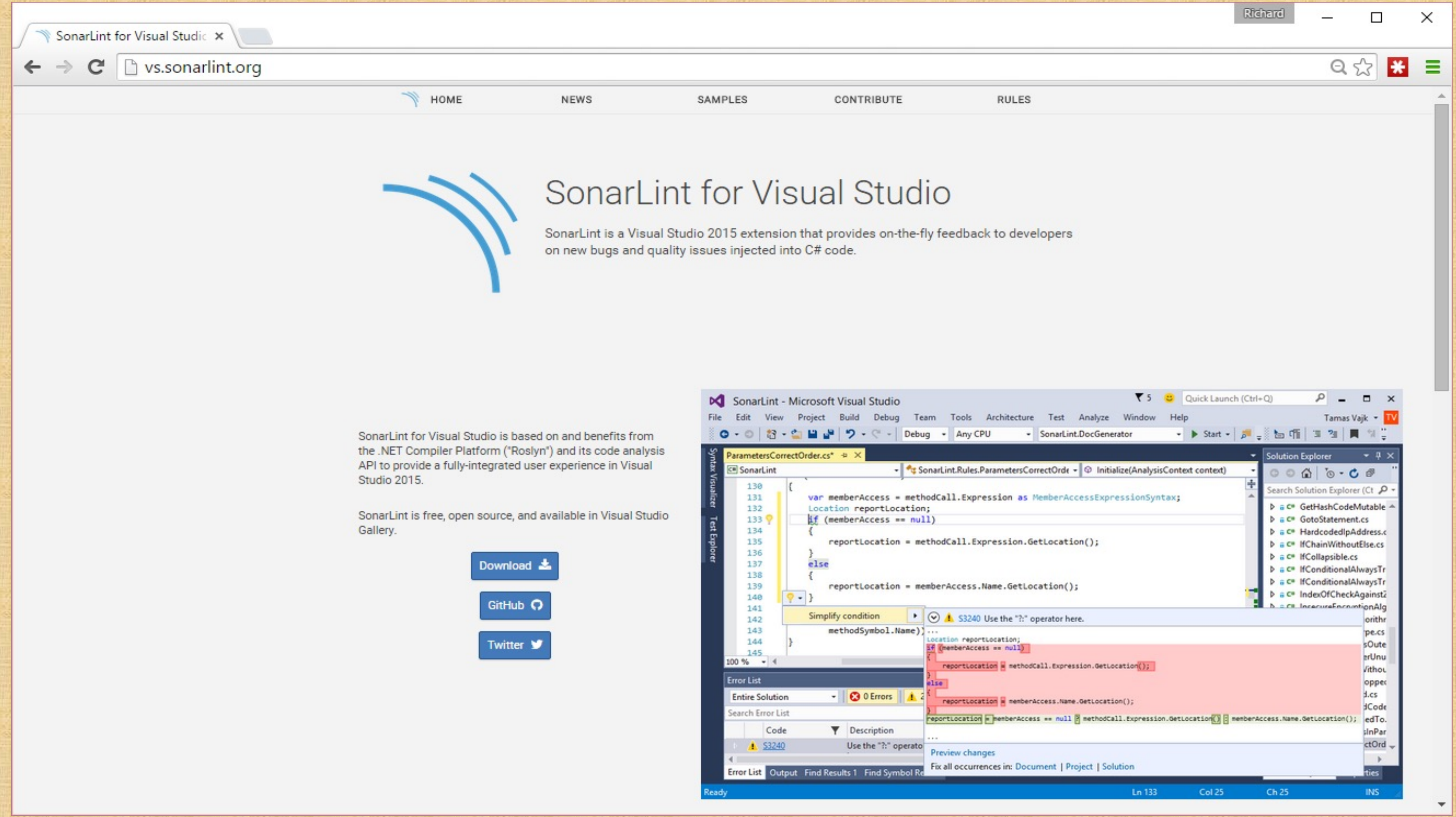
Events All

Oct 07 2015	Version	1.0

Demo

SonarQube Dashboards

Author: Nho Luong
Skill: DevOps Engineer Lead



SonarLint for Visual Studio

SonarLint is a Visual Studio 2015 extension that provides on-the-fly feedback to developers on new bugs and quality issues injected into C# code.

SonarLint for Visual Studio is based on and benefits from the .NET Compiler Platform ("Roslyn") and its code analysis API to provide a fully-integrated user experience in Visual Studio 2015.

SonarLint is free, open source, and available in Visual Studio Gallery.

```
{
    var memberAccess = methodCall.Expression as MemberAccessExpressionSyntax;
    Location reportLocation;
    if (memberAccess == null)
    {
        reportLocation = methodCall.Expression.GetLocation();
    }
    else
    {
        reportLocation = memberAccess.Name.GetLocation();
    }

        methodSymbol.Name));
}
```

S3240 Use the "?:" operator here.

```
...
Location reportLocation;
if (memberAccess == null)
{
    reportLocation = methodCall.Expression.GetLocation();
}
else
{
    reportLocation = memberAccess.Name.GetLocation();
}
reportLocation = memberAccess == null ? methodCall.Expression.GetLocation() : memberAccess.Name.GetLocation();
...
```

Preview changes

Fix all occurrences in: Document | Project | Solution

	Code	Description
⚠	S3240	Use the "?:" operato

Author: Nho Luong
Skill: DevOps Engineer Lead

Future of Microsoft & SonarQube

- Enhancing the interaction, including
  - ‘In the box’ on-prem in TFS 2015 Update 1 (but you can set it up now)
  - Seamless Active Directory Integration
  - One-click install of SonarQube
  - SonarQube Widget on VSO/TFS
  - TFVC support (Code ownership etc.)
  - Issue filtering to prevent "warning fatigue"
  - Pull requests integration

Author: Nho Luong
Skill: DevOps Engineer Lead

Resources

- SonarQube

  http://www.sonarqube.org/

- Microsoft Product Team on Technical Debt

  http://blogs.msdn.com/b/visualstudioalm/archive/tags/managing+technical+debt/

- ALM Rangers Guide on SonarQube

  https://github.com/SonarSource/sonar-.net-documentation
  http://blogs.msdn.com/b/visualstudioalmrangers/archive/tags/vsartechnicaldebt/

- SonarLint

  http://vs.sonarlint.org/

Thank You

Author: Nho Luong
Skill: DevOps Engineer Lead