

Dogfooding Developer Productivity: Development Process at JetBrains



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Head of Product

Dogfooding Developer Productivity

Development Process at JetBrains





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Repository

Git Repository

- All IJ-based IDEs, Fleet, some non-bundled plugins
- Continuous history since 2005 (migrated from Perforce+Subversion)
- 20G, >1M commits
- 9.5M LOC Java, 4.2M LOC Kotlin, also Groovy, JS, Python, C++, Go, Rust...
- 300-400 active developers

Space is a complete software development platform

Integrated with JetBrains IDEs

Try for free

▶ Watch an overview

 New release

Space On-Premises Beta is here!

Download for free

Git
hosting



Code
review



CI/CD
pipelines



Package
management



IDE plugin



Cloud dev
environments



Documents



File storage



Issue
tracker



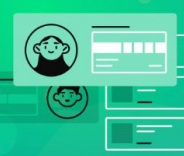
Chats



Guest users



Teams



Git Repository Hosting: Space

- Scalable distributed architecture
- ~10 fetch requests/second (mostly build agents)
- Automated repo maintenance
- Open-source part mirrored to GitHub





Open in IDE

Clone...

<> Files

Commits

Branches

Author ▾

Branch ▾

Start date



End date

Filter commits

Filter by path



Show all refs



Hide merge commits



IDEA-298168 Show tips each day, not once in 24 hours [...]



Konstantin Hudyakov, 25 Oct 17:40 223



SDP-1785 / Fix tests!

Yaroslav Russkih, 3m ago [yrusskih/sdp-1785-bake-file-tree-comparator](#)

IJ-MR-96805



cleanup[gitlab] Provide avatarIconsProvider from filter view model

Pavel Gromov, 8m ago [pg/gitlab/review-list-features](#)

IJ-MR-97051



fix[gitlab] Check server prefix on avatar url

Pavel Gromov, 25 Oct 13:55

IJ-MR-97051



feat[gitlab] Update merge request presentation [...]

Pavel Gromov, 24 Oct 15:38

IJ-MR-97051

Changes

Git Repository Branches

- `master` branch for ongoing development
 - Linear history, no merge commits
 - Nightly builds expected to be stable enough for internal use
- Stable branches every 4 months (221, 222, 223...), created 6 weeks before release
- Weekly release branches for EAP builds and bugfix updates (e.g. 222.4345)
- Limited use of feature branches (prefer feature flags)



Local Dev Environment

Environment Setup

- Install Git and Toolbox App
- Log in to Toolbox Enterprise
- Install IntelliJ IDEA
- Clone and open project
- IDE downloads JDK and dependencies
- Done



Toolbox Enterprise

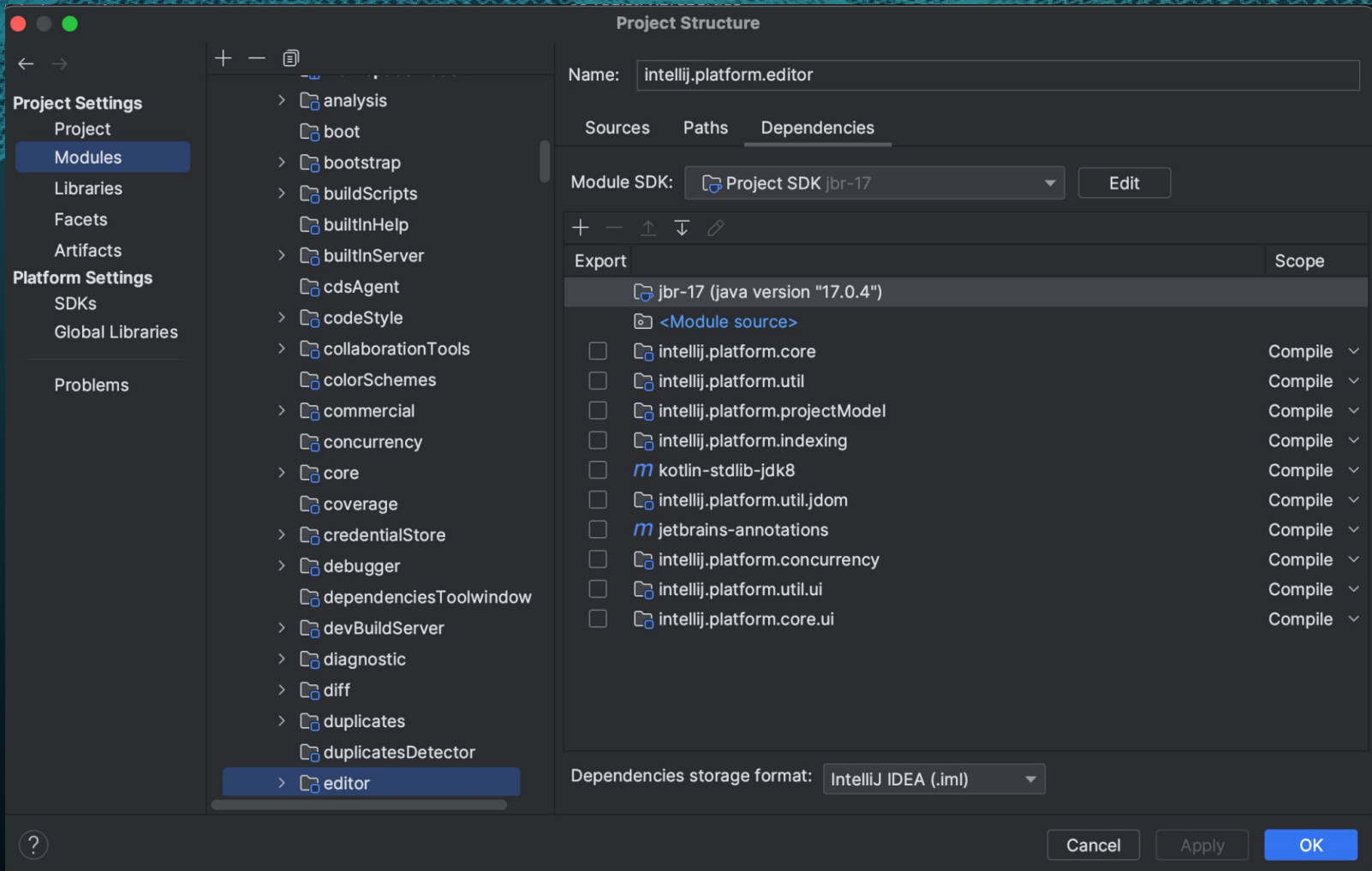
- Service for provisioning JetBrains IDEs to developers' machines
- Allows administrators to define common plugins and settings
- Collects telemetry data from developer machines and provides it to admins

<https://www.jetbrains.com/toolbox-enterprise/>



Project Setup

- Single IntelliJ project for the entire monorepo, ~2400 modules
 - Built with JPS (JetBrains Project System), IntelliJ IDEA's internal build tool
- No Maven or Gradle
- Dependencies referenced via Maven coordinates
 - Non-public dependencies hosted in Space Packages
- Shared run configurations for different IDEs or sets of plugins



Debug

-  DataSpell (dev build)
-  GoLand (dev build)
-  IDEA (dev build)
-  PhpStorm (dev build)
-  Aqua IDE
-  IDEA with KMM
-  IDEA for UI tests
-  Kotlin Notebook
-  BigDataTools
-  IDEA Community (K2 Kotlin)
-  CLion utilities - Segger Devices Parser
-  CLion with Swift
-  AppCode
-  AppCode with KMM
-  CLion
-  CLion for Dev Build Server
-  DataGrip
-  DataSpell
-  FleetBackend
-  Generate DB Model
-  GoLand

1

 IDEA

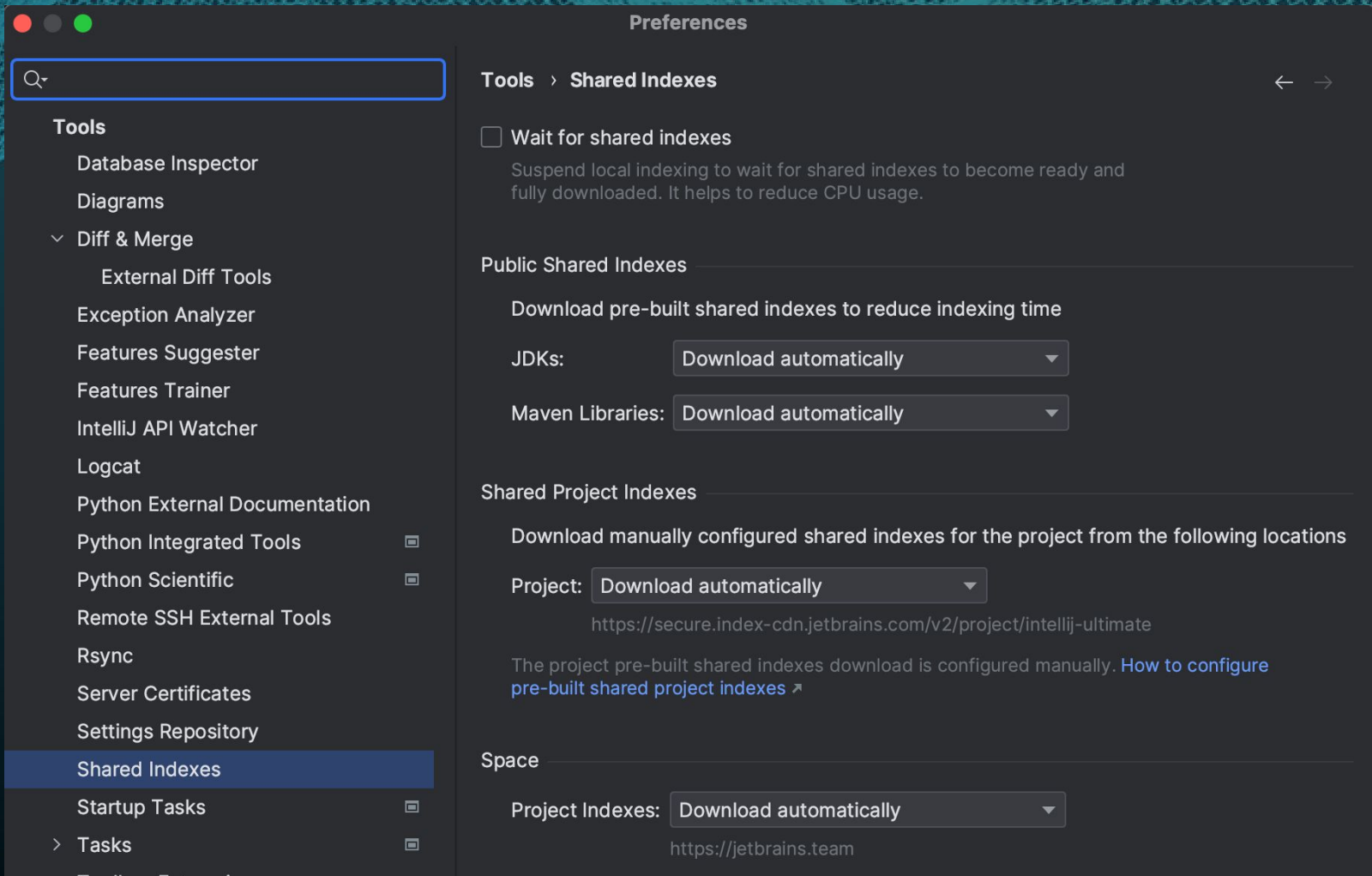


 IDEA funTests

Hold  to Debug

Shared Indexes

- Public infrastructure for indexes of JDKs and libraries from Maven Central
- TeamCity build for indexing monorepo source code
 - ~40 min to build index, ~1G artifacts
- Reduces project indexing time from 7 min to 1 min
- Working on “Turbocharged shared indexes”, will reduce indexing time to ~0



Local Build

- Local full rebuild takes 15-20 min on a fast machine
 - Normally at most a few times a week
- Incremental build after a change can be as quick as 5-10 sec
- Our Java runtime version incorporates DCEVM for better hotswap

JPS Caches

- Downloading .class files and incremental compilation caches from CI
- “Every build is an incremental build”
- Internal feature, not currently available to external users

IntelliJ Development Pulse

About

Build versions distribution

Indexing

Indexing duration

VFS refresh
duration

Indexes rescan
duration

Compilation

Freezes

IDE errors

VCS operations

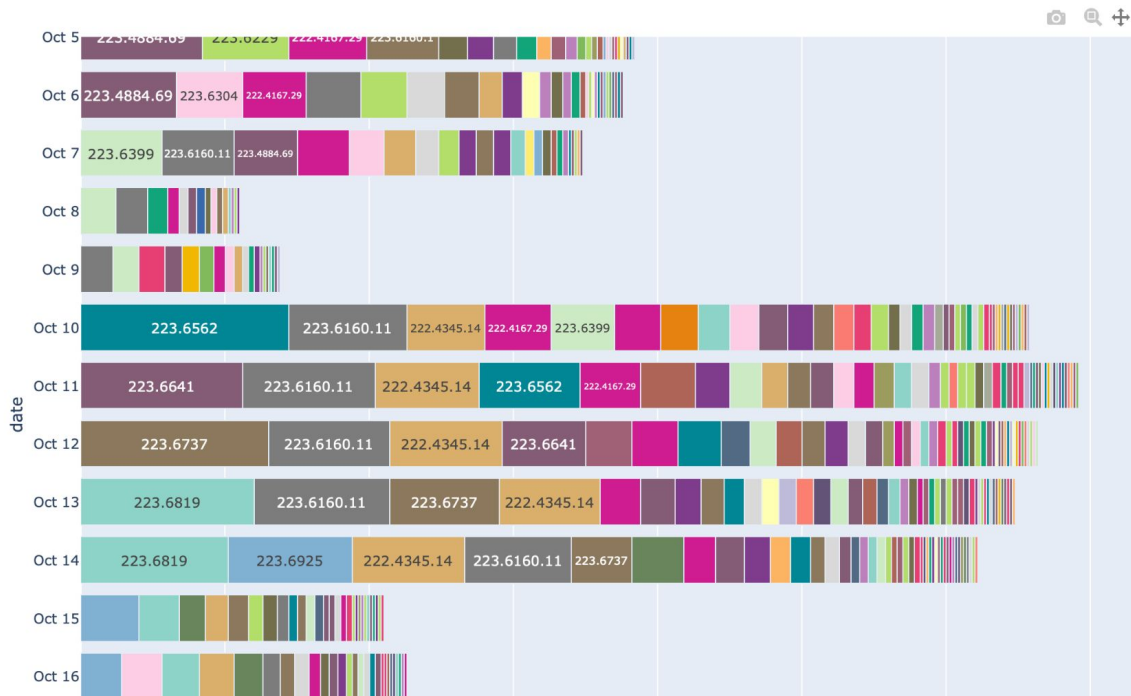
Popup latency

Code completion

More

Build versions distribution

Explore the daily number of internal users who worked on the IntelliJ project in their IDE with a specific build.





Tests and CI

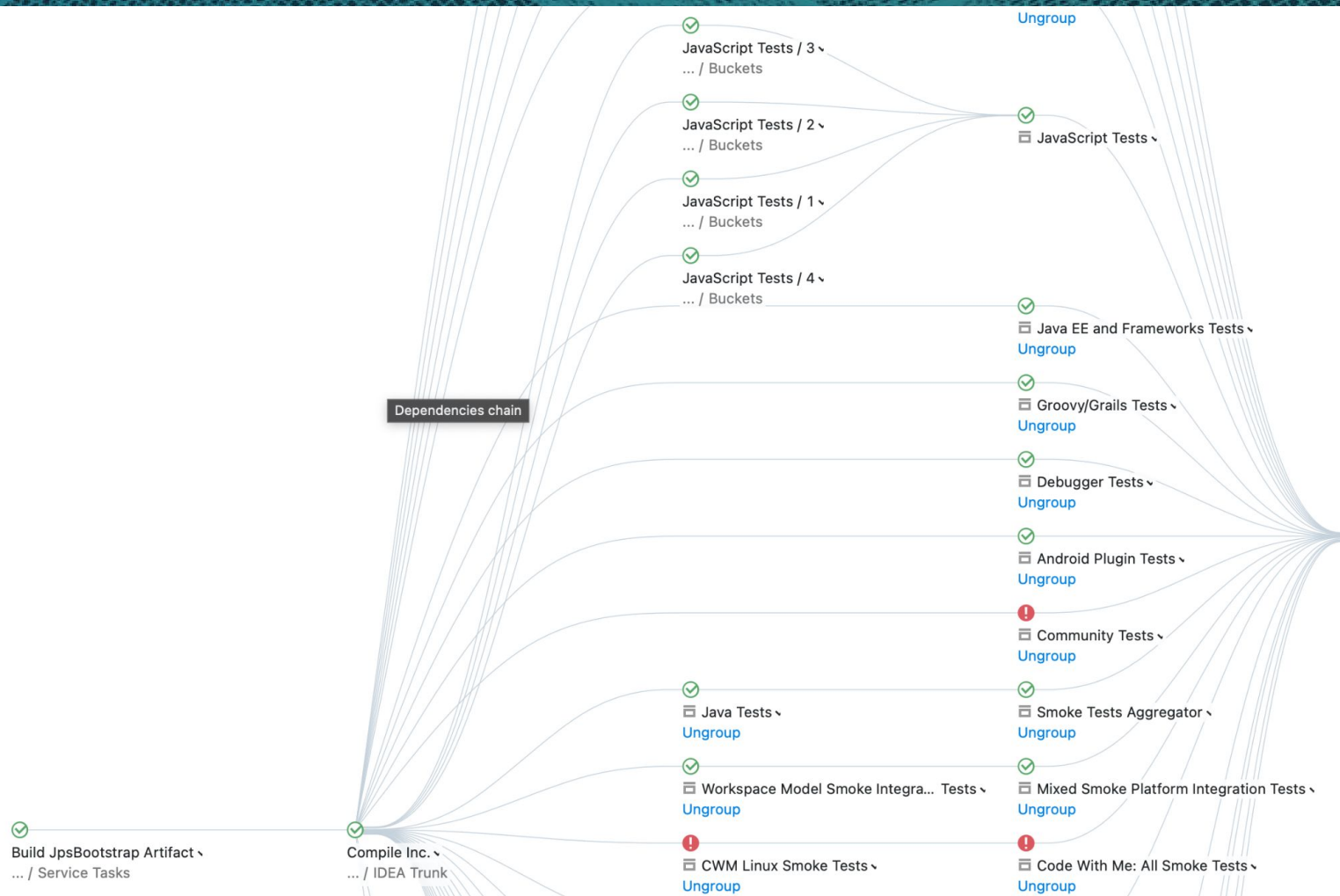
CI Server: TeamCity

- Kotlin DSL for configuration, ~87K LOC
- >1000 agents used for IJ-related builds, mostly running in AWS



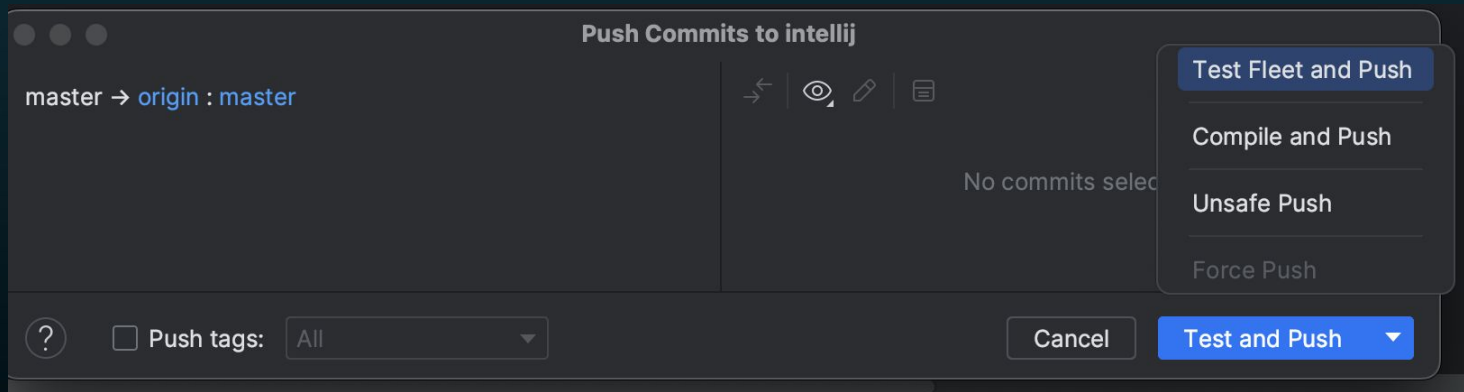
Tests

- Most of tests are functional, not unit
 - JUnit 3, JUnit 4, JUnit 5, TestNG, Cucumber
 - No dependency on implementation, tests carry value over decades
- Aggregator: CI build running full test suite
 - ~260K tests distributed over >200 builds running in parallel
 - 50-70 min total execution time
- Flaky tests are a constant struggle



Safe Push

- IDE plugin to run tests on a set of changes and merge them if successful
- Doesn't require manual branch management
- Retries tests to mitigate flakiness



Cherry-Pick Robot

- Space extension to trigger cherry-pick to stable branch from code review
- Runs tests before cherry-picking changes
- Requires TL/QA approval for cherry-pick to release branch

... / [Open](#) 27897 Generate correct versions and license URLs for NPM packages in Jupyter frontend



Waiting for reviewer ▾

TeamCity Cherry-Pick Robot



Target branch

refs/heads/223 ▾

- ☒ Close the review if cherry-pick is successful
- ☒ Include review ID in commit message
- ☒ Add "cherry picked from commit..." information to cherry-picked commits
- ☐ Compile only

Cancel

Run

Details ▸

Generate correct versions and license URLs for NPM packages in Jupyter frontend

intellij (64 branches include all commits)

master

CWM-7234-Bundle_third-party_licenses_for_remot...

show 62 more

TeamCity Cherry-Pick Robot

Reviewers ▾



Ilya Kazakevich

Reviewing the changes



Add reviewer

Release Build

- Code to produce release artifacts from a tree of .class files
- Used to be driven by Gant, now mostly Kotlin code
- Easy to run locally



Code Review

Code Reviews

- Mostly post-commit (post-merge) reviews
 - Cherry-picks to stable branches require pre-merge review
- Previously used Upsource, now Space
- Automatic reviewer suggestions
- IntelliJ IDEA plugin for reviews in IDE

support urlencoded paths in file:// links (IDEA-298570) IJ-CR-96708

[Show Timeline](#)

Author

 **Sergey Simonchik**

Reviewers

 **Dmitry Jemerov** you

Wait for Response

Accept

Leave review

 **Andrey Uskov**

Branches with all commits from code review

 master

 WEB-57846

[Show 19 more](#)

support urlencoded paths in file:// links (IDEA-298570) IJ-CR-96708



Sergey Simonchik 18.10.22, 16:11

created a code review for 1 commit

90b7f9e support urlencoded paths in file:// links (IDEA-298570)
Sergey Simonchik, 18.10.22, 16:03



Sergey Simonchik 18.10.22, 16:12

added Andrey Uskov as a reviewer



Sergey Simonchik 18.10.22, 20:59

added 1 commit to the code review

5649f5f fallback to original path in case of illegal characters in encoded file:// links
Sergey Simonchik, 18.10.22, 19:58



Sergey Simonchik 18.10.22, 21:05

To 223

[Reply](#)



Issue Tracking

Issue Tracking: YouTrack

- >500K issues for all IDEs (including resolved), 99% public
- ZenDesk integration for triaging of incoming issues by support team
- Actively using workflows
 - First user issue, “waiting for reply” status, conditionally required fields etc.



Exception Analyzer

- Custom system for receiving, processing and managing error reports
 - IDE exceptions, freezes, out-of-memory errors, JVM crashes
- ML-based grouping and assignment
- IDE plugin for managing and fixing the problems

Me

82 (513 reports)

Id	Title	Assignee	Project	Until
EA-724330	NCDFE: HtmlSyntaxHighlighterFactory.createHighlighter	Dmitry Jemerov	IntelliJ	223.6646.99
EA-723808	T: ActionsCollectorImpl\$ActionUpdateStatsKey.hashCode	Dmitry Jemerov	IntelliJ	223.6646.115
EA-720508	T: StringsKt__StringsJVMKt.endsWith	Dmitry Jemerov	IntelliJ	223.6646.113
EA-719410	T: InjectionRegistrarImpl.parseFile	Dmitry Jemerov	IntelliJ	223.6646.110

Date: 17 Oct 2022

Product: IDEA

Version: 223.6646.99

Linker: Exception Analyzer

Plugin: IDEA CORE 223.6646.99

OS:

java.lang.RuntimeException: Obtaining tokens error.

OK let's see. Host file: JSFile:MorePropTypes.js in '/home/joschi/Stuff/bust

Was injected Language: HTML at ranges: [Shred suffix='propName' in JSStringT

psi	InjectionRegistrarImpl.parseFile(InjectionRegistrarImpl.java)
psi	InjectionRegistrarImpl.createAndRegisterInjected(InjectionRegistrarImpl.java)
psi	InjectionRegistrarImpl.doneInjecting(InjectionRegistrarImpl.java)
javascript	JSInjectionUtil.concatenationAwareInject(JSInjectionUtil.java)

04.04.18 Kudravnsev

04.04.18 Kudravnsev

17.05.19 Kropotov

10.06.19 Kropotov



Static Code Analysis

Static Code Analysis

- Shared inspection profile
- Custom Structural Search inspections for project-specific code patterns
- No inspections for naming or formatting
- Inspections run locally during development and on TeamCity

Profile: idea.default Project



Alarm constructor can be simplified	⚠	✓
Anonymous Disposable passed to method	⚠	✓
Anonymous threads are discouraged; pleas	⚠	✓
Arrays.asList() is not immutable	⚠	✓
can be simplified to ReadAction.compute()	⚠	✓
can simplify to getInstanceEx()	⚠	✓
can use ArrayUtil	⚠	✓
can use ContainerUtil	⚠	✓
can use StringUtil	⚠	✓
Comparing Swift Types without context	⚠	✓
Consider explicit delete when file is not nee	⚠	✓
DataContext.getData(String)	⚠	✓
DataKey API	⚠	✓
DBE model property must be public	⚠	✓
DirectCallOfDispose	⚠	✓
Disposable instance by lambda	⚠	✓
Don't read channels with for, use consume/	⚠	—
Don't use Channel in function signatures, cc	⚠	✓
Don't use javax.swing.FocusManager	⚠	✓
Double ' in without { in property value	⚠	✓
EventLogGroup version should be > 0	⚠	✓
Explicit cast to specific SwiftType	⚠	✓

No description provided

Scope:

Severity:

Highlighting in editor:

In All Scopes

⚠ Warning

Warning

Options

[Reset](#)[Edit Metadata...](#)

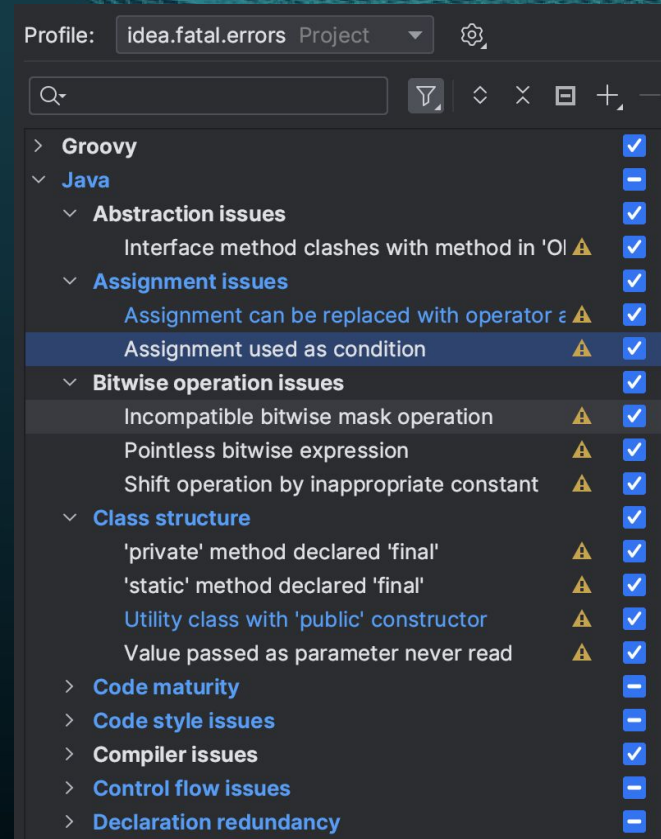
Templates:



```
⌘ $Var2$.getData($Var3$.getContext()) ⇒ $Var3$.get  
⌘ $Var2$.getData($Var3$.dataContext) ⇒ $Var3$.get  
⌘ $Var2$.getName().equals($Var3$) ⇒ $Var2$.is($Va  
⌘ $Var3$.equals($Var2$.getName()) ⇒ $Var2$.is($Va  
⌘ $Var2$.getName() == $Var3$ ⇒ $Var2$.is($Var3$)  
⌘ $Var3$ == $Var2$.getName() ⇒ $Var2$.is($Var3$)  
⌘ $Var2$.name == $Var3$ ⇒ $Var2$.`is`($Var3$)  
⌘ $Var3$ == $Var2$.name ⇒ $Var2$.`is`($Var3$)
```

Zero Tolerance Inspections

- ~200 inspections which are actively monitored and fixed



ACTUAL PROBLEMS

36

BASELINE

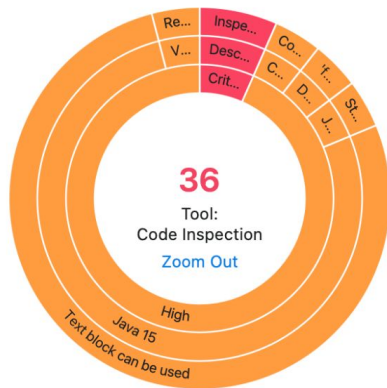
0

CHECKS

214

In 43 categories

PROJECT AUDIT

Use license audit to check
license compatibility

Files and folders: All ▾

Tool: Code Inspection ▾ ×

Severity: All ▾

Category: All ▾

Type: All ▾

Save as...

Problems 36

Files 11

Search



Group by: File ▾

Move to baseline



Problems → ● → ●

Category

Type

KtorOpenApiInspection.kt

Inspection does not have a description

Description file

Inspection description c...

ExtractKtorModuleInspection.kt

Inspection does not have a description

Description file

Inspection description c...

Py3TypeCheckerInspectionTest.java

Concatenation can be replaced with text block

Java 15

Text block can be used



Summary

JetBrains Products

- IntelliJ IDEA - Shared {indexes, code style, inspection profiles, run configurations}
- JetBrains Space - Git hosting, code review, package repository
- TeamCity - Test and release automation
- YouTrack - Issue tracking
- Toolbox Enterprise - Managing the fleet of IDEs on devs' machines



Custom Tools

- JPS caches
- Safe push plugin
- Cherry-pick robot
- Exception analyzer

Takeaways

- Try out Toolbox Enterprise for management of JetBrains IDEs
- Configure shared indexes to save time on indexing
- Use Structural Search inspections to define project-specific checks

THANKS

Have any questions?

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www.jetbrains.com/careers