**Introduction**

**Author1:** To support our claim regarding the bias existing in the nullness inference tools evaluation when conducting annotation reconstruction experiments, we need to compare the pre- and post-checked versions of the code. We expect that this comparison will show that the code changes when adding annotations and that these changes favor the checker used to typecheck the project.

Choosing the correct commits for the pre- and post-checked versions is a delicate task. In reality, developers do not always add the checker dependencies, annotations, and possible modifications to the code in a single commit. Therefore, for each project under investigation, we need to decide which commits should be considered as the pre- and post-checked versions.

Some challenges:

1. Several of the projects had @Nullable annotations long before adding the checker dependencies and using them. It is sometimes hard to determine why. Additionally, we must answer this question: do we consider these projects *never checked by a nullability-related tool*? I think we should, as long as we don’t find any other checker/tool dependencies in their history. For this, we might need a list of available nullability-related tools other than CFNullness and Nullaway.

I will gradually add the story behind each project, extracted by running tools like *git log* and *git blame* and thoroughly investigating each version of the project. For each, please read the story and provide your opinion in the provided table so we can decide accurately and document our reasons in a structured way.

**FloatingActionButtonSpeedDial project:** <https://github.com/leinardi/FloatingActionButtonSpeedDial/>

1. They added the @Nullable annotations for the first time on 31-Mar-18: [df35e734cdd7d2521ba04680b73547ce9cf87925](https://github.com/leinardi/FloatingActionButtonSpeedDial/commit/df35e734cdd7d2521ba04680b73547ce9cf87925) by adding 10 @Nullable annotations to the Java files. They added and used findbugs in [1df90d49de94b31dd373195dfaed5acf4ffec961](https://github.com/leinardi/FloatingActionButtonSpeedDial/commit/1df90d49de94b31dd373195dfaed5acf4ffec961) on 08-Apr-18. Author3’ Comment (Aug 5): This commit is a huge set of changes. It looks like this is the point of differentiation between this project and the project from which it was forked.
2. Then, they added the checker dependencies on 11-Apr-18: [c223ed28c8c3ae9fb8906ac0dcd65fe046473a6d](https://github.com/leinardi/FloatingActionButtonSpeedDial/commit/c223ed28c8c3ae9fb8906ac0dcd65fe046473a6d). Before this commit, they had a total of 28 @Nullable annotations in their Java files.
3. On the same day (11-Apr-18), they added missing @Nullable annotations: [c762d31a32015229c67f2e9a69b2f3bdea54de60](https://github.com/leinardi/FloatingActionButtonSpeedDial/commit/c762d31a32015229c67f2e9a69b2f3bdea54de60). After this commit, they had a total of 51 @Nullable annotations. I call this the *checked version*.
4. The next time they added @Nullable annotations was on 14-Apr-18 when they added one more @Nullable annotation during some code cleaning: [4527029c4d5c429a8800b763695c28ae9586b4f8](https://github.com/leinardi/FloatingActionButtonSpeedDial/commit/4527029c4d5c429a8800b763695c28ae9586b4f8).
5. As of the present time, they have 68 @Nullable annotations in their Java files.
6. Before adding any @Nullable annotations: [41f5062f5f49b3571a7ddbcb8c2873b8aa541c62](https://github.com/leinardi/FloatingActionButtonSpeedDial/commit/41f5062f5f49b3571a7ddbcb8c2873b8aa541c62)
7. Before adding the checker dependencies: [556b84fc516b1b0764aa7e2c20a652ff03207ee9](https://github.com/leinardi/FloatingActionButtonSpeedDial/commit/556b84fc516b1b0764aa7e2c20a652ff03207ee9)

Based on this, at first sight, it seems that they were trying to type-check their program regarding nullability using Nullaway from 31-Mar-18 until 11-Apr-18. However, there are many other commits for adding new features to their project during this time between *before adding any annotation* (Number 6) and the *checked version* (number 3): 140 files changed, 6022 insertions(+), 1418 deletions(-). Author3: I agree that this is a good reason not to use the version from 31/3/18 as the initial commit.

Therefore, I suggest considering the version *before adding the Checker dependencies* (Number 7) and the *checked version* (Number 3) since they had changed the code to satisfy Nullaway (e.g., by checking whether objects are null before dereferencing), and the changes are almost exclusively related to nullability checking. This can support our claims since the program is being checked for the first time, and it is also accurate in the way that the possible unrelated changes are not considered, which can act as a confounder.

The diff between number 7 and number 3: 5 files changed, 62 insertions(+), 27 deletions(-). Example of changes: adding conditions to check if variables are not null before dereferencing. (Not related: I doubt whether the changes are actually mostly checker-specific (to the extent that it can be considered a bias in evaluations); we need to see the results of Annotator and WPI side-by-side to determine the truth.)

**Please add your opinion in this table under your name, especially if you have a different idea.**

**FloatingActionButtonSpeedDial**

|  |  |  |  |
| --- | --- | --- | --- |
| **Author** | **Pre-version** | **Post-version** | **Reason** |
| Author1 | [556b84fc516b1b0764aa7e2c20a652ff03207ee9](https://github.com/leinardi/FloatingActionButtonSpeedDial/commit/556b84fc516b1b0764aa7e2c20a652ff03207ee9) | [c762d31a32015229c67f2e9a69b2f3bdea54de60](https://github.com/leinardi/FloatingActionButtonSpeedDial/commit/c762d31a32015229c67f2e9a69b2f3bdea54de60) | Changes are nullness-specific. |
| Author2 |  |  |  |
| Author3 | [556b84fc516b1b0764aa7e2c20a652ff03207ee9](https://github.com/leinardi/FloatingActionButtonSpeedDial/commit/556b84fc516b1b0764aa7e2c20a652ff03207ee9) | [c762d31a32015229c67f2e9a69b2f3bdea54de60](https://github.com/leinardi/FloatingActionButtonSpeedDial/commit/c762d31a32015229c67f2e9a69b2f3bdea54de60) | Agree with Author1’s reasoning |
| Author4 |  |  |  |

**For caffeine:**

<https://github.com/ben-manes/caffeine>

1. They added @Nullable annotations for the first time on 13-Dec-14 to use the FindBug plugin: [fe7868081a80e9daf422a63b567ae09cb99e4968](https://github.com/ben-manes/caffeine/commit/fe7868081a80e9daf422a63b567ae09cb99e4968) by adding 4 @Nullable and 4 @SuppressWarnings annotations.
2. On 31-Jan-15 they added the ErrorProne plugin: [2143f294bf0e1ec32ff65b6cc47691bda1ed7b7f](https://github.com/ben-manes/caffeine/commit/2143f294bf0e1ec32ff65b6cc47691bda1ed7b7f). Before this and in this commit they had 63 @Nullable, and 111 @Nonnull, and 83 @SuppressWarnings annotations. Author3: This commit doesn't actually add any of these @Nullable annotations, though - it looks like they'd been using them consistently (as documentation?) even before this.
3. They added “Nullaway dependencies on 01-Jan-2018 (apparently they are quite hardworkers 🙂): [6cefa5d8942f9d02146c77965a70ed766f8e8dc0](https://github.com/ben-manes/caffeine/commit/6cefa5d8942f9d02146c77965a70ed766f8e8dc0). In this commit they had 339 @Nullable, 182 @Nonnull, 330 @SuppressWarnings annotations, and 342 of java.util.Objects.requireNonNull usages. (They had 1 annotation @CheckForNull). Author3: To me, this commit seems to be the one where they committed to a nullness analysis. I think the "before" version definitely has to be before this commit, and maybe should be immediately before.
4. Before adding Nullaway, [ace16b76481b879d3629e23d45b4177f2e9629b4](https://github.com/ben-manes/caffeine/commit/ace16b76481b879d3629e23d45b4177f2e9629b4) (28-Dec-17)  they had 119 @Nullable, 180 @Nonnull, and 291 @SuppressWarnings annotations, and 340 of java.util.Objects.requireNonNull usages. The diff between this commit and the number 3: 50 files changed, 375 insertions(+), 437 deletions(-).
5. They have migrated to the CheckerFramework ***annotations*** from JSR-305 ones  on 29-May-18: [5851960f38b4431891a185b5105affbf1ec4228f](https://github.com/ben-manes/caffeine/commit/5851960f38b4431891a185b5105affbf1ec4228f) in which they had 347 @Nullable, 198 @NonNull, 347 @SuppressWarnings annotations, and 346 of java.util.Objects.requireNonNull usages. Author3: This commit is definitely just changing the annotation imports (probably because it was clear at this time that JSR 305 was never going to be merged into the JDK).
6. Before adding the CheckerFramework, [b8e6867709520142be87f72504920b20a63674ee](https://github.com/ben-manes/caffeine/commit/b8e6867709520142be87f72504920b20a63674ee), they had 346 @Nullable, 199 @Nonnull,  347 @SuppressWarnings, and 346 of java.util.Objects.requireNonNull usages.
7. Apparently, in  [2e6d32844e033399e63e42c88e0ea8b587879af3](https://github.com/ben-manes/caffeine/commit/2e6d32844e033399e63e42c88e0ea8b587879af3), on 30-May-18, they fixed some of the warnings in which they had 284 @Nullable, 214 @NonNull, 347 @SuppressWarnings annotations, and 346 of java.util.Objects.requireNonNull usages. The diff between this and number 6 is: 86 files changed, 611 insertions(+), 396 deletions(-).

I believe for Nullaway, we should consider number 4 as the pre-checked version and number 3 as the checked version. Also, for CheckerFramework, we should consider number 6 and pre-checked and number 7 as the checked version.

**Please add your opinion in this table under your name, especially if you have a different idea.**

**Caffeine**

|  |  |  |  |
| --- | --- | --- | --- |
| **Author** | **Pre-version** | **Post-version** | **Reason** |
| Author1 | **Nullaway:** ace16b76481b879d3629e23d45b4177f2e9629b4  **CFNullness:** b8e6867709520142be87f72504920b20a63674ee | **Nullaway:** 6cefa5d8942f9d02146c77965a70ed766f8e8dc0  **CFNullness:**  2e6d32844e033399e63e42c88e0ea8b587879af3 | Changes are checker specific. |
| Author2 |  |  |  |
| Author3 |  |  | I agree with Author1’s reasoning (see comments above) |
| Author4 |  |  |  |

**For meal-planner:**

<https://github.com/fzuellich/meal-planner>

1. They added Nullaway and one @Nullable annotation for the first time on 11-May-18: [fa953d7d669eab706afb675628eb1be68caa7ca1](https://github.com/fzuellich/meal-planner/commit/fa953d7d669eab706afb675628eb1be68caa7ca1).
2. Before adding Nullaway, they added the FindBugs plugin on the same day (11-May-18): [534de2074178ed4cfd34a23cad1212f76016ad9e](https://github.com/fzuellich/meal-planner/commit/534de2074178ed4cfd34a23cad1212f76016ad9e) without having any annotations.
3. They changed the code regarding null-related and other small bugs, along with other minor changes on 20-May-18, including adding some null-checks but without any new annotations: [02cd573b87afa132644d994aed094b7edea21154](https://github.com/fzuellich/meal-planner/commit/02cd573b87afa132644d994aed094b7edea21154).
4. On the same day, they added two more @Nullable annotations on 20-May-18: [5238c473487aa7338dff227ec9d6c52bacd8233d](https://github.com/fzuellich/meal-planner/commit/5238c473487aa7338dff227ec9d6c52bacd8233d).

It seems that they started a nullability checking procedure on 11-May-18 and addressed some warnings on 20-May-18. We can consider number 2 as the pre-checked version and number 4 as the checked version. The diff between these two (concentrating on Java files): 28 files changed, 831 insertions(+), 229 deletions(-). However, the changes in between are not exclusively related to nullness. For instance, there is one commit in between ([88ccda6c52ac728b1c67bbb498180010b367cbc2](https://github.com/fzuellich/meal-planner/commit/88ccda6c52ac728b1c67bbb498180010b367cbc2)) on 11-May-18 in which they added some new features to their program.(Author3: One option would be to revert this specific commit (and any others that are unrelated to nullness) while keeping number 4 as the "post" version. I'd prefer the "post" version to include all of the changes that we know about that involve nullness checking.)  Hence, I think it is better to consider number 2 as the pre-checked version and number 1 as the checked version since the changes are exclusively related to nullness here. Diff: 15 files changed, 111 insertions(+), 83 deletions(-).

**Please add your opinion in this table under your name, especially if you have a different idea.**

**meal-planner**

|  |  |  |  |
| --- | --- | --- | --- |
| **Author** | **Pre-version** | **Post-version** | **Reason** |
| Author1 | [534de2074178ed4cfd34a23cad1212f76016ad9e](https://github.com/fzuellich/meal-planner/commit/534de2074178ed4cfd34a23cad1212f76016ad9e) | [fa953d7d669eab706afb675628eb1be68caa7ca1](https://github.com/fzuellich/meal-planner/commit/fa953d7d669eab706afb675628eb1be68caa7ca1) | Changes are nullness specific. |
| Author2 |  |  |  |
| Author3 |  |  |  |
| Author4 |  |  |  |

**For Picasso:**

<https://github.com/square/picasso/>

1. They added the first @Nullable annotations on 09-Jun-16 by adding 23 @Nullable (android.support.annotation.Nullable) annotations to their public APIs, apparently for documentation: [5208d48afbdd4cb2b51dbfe11946a5a9e6c518e2](https://github.com/square/picasso/commit/5208d48afbdd4cb2b51dbfe11946a5a9e6c518e2).
2. They added Nullaway on 25-Aug-18, which includes 122 @Nullable and 17 @SuppressWarnings annotations, two of which are related to Nullaway: [466781f8feca2418e5d36eb45aa0cc0a7d8e1b62](https://github.com/square/picasso/commit/466781f8feca2418e5d36eb45aa0cc0a7d8e1b62).
3. Before adding Nullaway, they had 54 @Nullable annotations, but it seems they were just used for documentation (I could not find any evidence of using a checker): [589b0d617f9ba0b0e3e1834483810f9d19a874b4](https://github.com/square/picasso/commit/589b0d617f9ba0b0e3e1834483810f9d19a874b4).

I think we should consider number 3 as the pre-checked version and number 2 as the checked version. The diff (for Java files): 26 files changed, 270 insertions(+), 151 deletions(-).

**Please add your opinion in this table under your name, especially if you have a different idea.**

**Picasso**

|  |  |  |  |
| --- | --- | --- | --- |
| **Author** | **Pre-version** | **Post-version** | **Reason** |
| Author1 | [589b0d617f9ba0b0e3e1834483810f9d19a874b4](https://github.com/square/picasso/commit/589b0d617f9ba0b0e3e1834483810f9d19a874b4) | [466781f8feca2418e5d36eb45aa0cc0a7d8e1b62](https://github.com/square/picasso/commit/466781f8feca2418e5d36eb45aa0cc0a7d8e1b62) | Changes are nullness specific. |
| Author2 |  |  |  |
| Author3 | [589b0d617f9ba0b0e3e1834483810f9d19a874b4](https://github.com/square/picasso/commit/589b0d617f9ba0b0e3e1834483810f9d19a874b4) | [466781f8feca2418e5d36eb45aa0cc0a7d8e1b62](https://github.com/square/picasso/commit/466781f8feca2418e5d36eb45aa0cc0a7d8e1b62) | Agree with Author1’s reasoning. |
| Author4 |  |  |  |

**For cache2k**

<https://github.com/cache2k/cache2k>

1. They added the first @Nullable annotations on 18-Dec-13 by adding 6 @Nullable (org.cache2k.annotation.Nullable) annotations: (initial commit) [24f3c740319ed3222052fb028190c890803d7ea0](https://github.com/cache2k/cache2k/commit/24f3c740319ed3222052fb028190c890803d7ea0). There are no signs of nullness checking.
2. They added Nullaway on 07-Nov-20: [2c99f5090095554809c46aa6650fd9a4f413d464](https://github.com/cache2k/cache2k/commit/2c99f5090095554809c46aa6650fd9a4f413d464) in which they had 131 @Nullable and 167 @SuppressWarnings annotations.
3. Right before adding Nullaway, they did not have any @Nullable annotations but they had 149 @SuppressWarnings annotations mostly for "unchecked" and "rawtypes": [495a6491028d8eaa0ed9371ca974290d99c4686e](https://github.com/cache2k/cache2k/commit/495a6491028d8eaa0ed9371ca974290d99c4686e).
4. On 12-Nov-20 they switched to CFNullness annotations: [226d0c917d4e3bef68035782e0abc091e7e971d7](https://github.com/cache2k/cache2k/commit/226d0c917d4e3bef68035782e0abc091e7e971d7) in which they had 151 @Nullable, 31 @NonNull and @SuppressWarnings 173 annotations.
5. Before adding CFNullness, they had 131 @Nullable and 167 @SuppressWarnings annotations (no changes after the code was checked by Nullaway): [13c9b14a033d5f7aa2a33d498df223350d7a9e55](https://github.com/cache2k/cache2k/commit/13c9b14a033d5f7aa2a33d498df223350d7a9e55).

I think it is a really clear and beautiful benchmark, and based on this story, we should use number 3 as the pre-checked version and number 2 as the checked version for Nullaway, and number 5 as the pre-checked version and number 4 as the checked version for CFNullness.

**Please add your opinion in this table under your name, especially if you have a different idea.**

**Cache2k**

|  |  |  |  |
| --- | --- | --- | --- |
| **Author** | **Pre-version** | **Post-version** | **Reason** |
| Author1 | Nullaway: [495a6491028d8eaa0ed9371ca974290d99c4686e](https://github.com/cache2k/cache2k/commit/495a6491028d8eaa0ed9371ca974290d99c4686e)  CFNullness: [13c9b14a033d5f7aa2a33d498df223350d7a9e55](https://github.com/cache2k/cache2k/commit/13c9b14a033d5f7aa2a33d498df223350d7a9e55) | Nullaway: [2c99f5090095554809c46aa6650fd9a4f413d464](https://github.com/cache2k/cache2k/commit/2c99f5090095554809c46aa6650fd9a4f413d464)  CFNullness: [226d0c917d4e3bef68035782e0abc091e7e971d7](https://github.com/cache2k/cache2k/commit/226d0c917d4e3bef68035782e0abc091e7e971d7) | Changes are nullness specific. |
| Author2 |  |  |  |
| Author3 |  |  | Agree with Author1. |
| Author4 |  |  |  |

**For Butterknife:**

<https://github.com/JakeWharton/butterknife/>

1. They added the first @Nullable annotations on 13-Mar-13 by adding 14 annotations for documentation since they used @see before them: [7f0f4f09d0ec9f7dc55ed8947e16bec17c29979b](https://github.com/JakeWharton/butterknife/commit/7f0f4f09d0ec9f7dc55ed8947e16bec17c29979b).
2. They added Nullaway on 09-Sep-18 by adding 62 @Nullable annotations: [c17c16c89c69bf280146888bbca5131f06857703](https://github.com/JakeWharton/butterknife/commit/c17c16c89c69bf280146888bbca5131f06857703). They also used java.util.Objects.requireNonNull.
3. Before adding Nullaway, they had 29 @Nullable annotations. There are no signs of using a checker: [be4792d8a8c76aebd0f90858a1ea426ed31fd36c](https://github.com/JakeWharton/butterknife/commit/be4792d8a8c76aebd0f90858a1ea426ed31fd36c).

It seems we should consider number 3 as the pre-checked version and number 2 as the checked version. Diff (Java files): 12 files changed, 81 insertions(+), 77 deletions(-).

**Please add your opinion in this table under your name, especially if you have a different idea.**

**Butterknife**

|  |  |  |  |
| --- | --- | --- | --- |
| **Author** | **Pre-version** | **Post-version** | **Reason** |
| Author1 | [be4792d8a8c76aebd0f90858a1ea426ed31fd36c](https://github.com/JakeWharton/butterknife/commit/be4792d8a8c76aebd0f90858a1ea426ed31fd36c) | [c17c16c89c69bf280146888bbca5131f06857703](https://github.com/JakeWharton/butterknife/commit/c17c16c89c69bf280146888bbca5131f06857703) | Changes are checker specific. |
| Author2 |  |  |  |
| Author3 |  |  | Agree with Author1. |
| Author4 |  |  |  |

**For Nameless-Java-API:**

<https://github.com/NamelessMC/Nameless-Java-API/>

1. They added the first @Nullable annotations on 26-Sep-21 by adding 6 @Nullable and 85 @NotNull annotations, and 7 @SuppressWarnings("null") (WHY? JetBrains?): [af92c0da744bf62168cf16961943813025e79d9](https://github.com/NamelessMC/Nameless-Java-API/commit/af92c0da744bf62168cf16961943813025e79d9).
2. They switched to CFNullness annotations from JetBrains on 20-Apr-22: [14829cf2d2f49673495ba76dcebde35617ce79cd](https://github.com/NamelessMC/Nameless-Java-API/commit/14829cf2d2f49673495ba76dcebde35617ce79cd), in which they had 25 @Nullable and 213 @NonNull annotations. (No nullness suppressions)
3. Before this switch, they had 26 @Nullable and 206 @NotNull annotations: [1c239f9f248e6619ce5783a1c0ebd021a7a7526e](https://github.com/NamelessMC/Nameless-Java-API/commit/1c239f9f248e6619ce5783a1c0ebd021a7a7526e). (No nullness suppressions)
4. Then, on 21-Apr-22, they resolved the CFNullness warnings: [0f5266d193a1b20419d49eb3fab0960d326f311c](https://github.com/NamelessMC/Nameless-Java-API/commit/0f5266d193a1b20419d49eb3fab0960d326f311c), in which they had 27 @Nullable and 211 @NonNull annotations.

I think they were using some nullability tool in number 1 because of suppressions. After a year, they switched to CFNullness in number 2 and resolved the errors in number 4. Hence, I think we should consider number 3 as the pre-checked version and number 4 as the checked version.

**Please add your opinion in this table under your name, especially if you have a different idea.**

**Nameless-Java-API**

|  |  |  |  |
| --- | --- | --- | --- |
| **Author** | **Pre-version** | **Post-version** | **Reason** |
| Author1 | [1c239f9f248e6619ce5783a1c0ebd021a7a7526e](https://github.com/NamelessMC/Nameless-Java-API/commit/1c239f9f248e6619ce5783a1c0ebd021a7a7526e) | [0f5266d193a1b20419d49eb3fab0960d326f311c](https://github.com/NamelessMC/Nameless-Java-API/commit/0f5266d193a1b20419d49eb3fab0960d326f311c) | Changes are checker specific. |
| Author2 |  |  |  |
| Author3 |  |  | Agree with Author1. Despite the evidence for some other checking tool, we’re confident it wasn’t a typechecker. |
| Author4 |  |  |  |

**For Table-wrapper-api: *CHALLENGING***

<https://github.com/spacious-team/table-wrapper-api/>

1. They added the first @Nullable annotations on 19-Oct-22 by adding 47 @Nullable (com.google.code.findbugs jsr305), 1 @NonNull, and a total of 12 @SuppressWarnings annotations (none related to nullness): [0dda92e5468e5677a7773f5ca62ed2ba1b719cf6](https://github.com/spacious-team/table-wrapper-api/commit/0dda92e5468e5677a7773f5ca62ed2ba1b719cf6).  Author3: We should ignore @SuppressWarnings annotations that aren't related to nullness. In this commit, looking at the build file, they are definitely using FindBugs as a checking tool.
2. On the next day (20-Oct-22), before adding CFNullness, they “removed one NPE” as the commit message says: [d4e4303c62d13d1ede3ddd8fec70124d65364bb2](https://github.com/spacious-team/table-wrapper-api/commit/d4e4303c62d13d1ede3ddd8fec70124d65364bb2). In this commit, they had 50 @Nullable and 1 @NonNull annotations, and a total of 12 non-nullness @SuppressWarnings annotations. They also added a new small Java file emptytablerow.java. I suspect that they were using FindBugs since in the next commits they used the word “switch” to CFNullness. However, by using the name “NPE” they might suggest that they found something at runtime. We cannot forget that it happened a day after adding the first @Nullable annotations. Hence, I think they used FindBugs to find some suspicious places and it was not a false positive; therefore, they called it an NPE. Not sure. Author3: This seems likely to me.
3. On the same day (20-Oct-22), they switched to CFNullness: [73a0fd50f9bf8a9e2218ba5231b97170b91dd273](https://github.com/spacious-team/table-wrapper-api/commit/73a0fd50f9bf8a9e2218ba5231b97170b91dd273). In this commit, they had 64 @Nullable annotations, the only @NonNull annotation from the previous commit was removed, they added 13 @SuppressWarnings for “nullness” and 4 @SuppressWarnings("NullableProblems") for the first time. I think the latter is related to IntelliJ IDEA. It seems they were using two static analysis tools simultaneously. Maybe they were frustrated with the NPE they found on the same day? 🙂
4. After that, they added more features to their program.

This project is a little challenging since they were using three nullability-related tools (FindBugs, IntelliJ IDEA nullability tool, and CFNullness) in just two days. I believe it is still legitimate to consider the commit ***before number 1 (before adding any annotations)*** ([b213629fbea6168bb9b7fb6f1cf397311ae1abaa](https://github.com/spacious-team/table-wrapper-api/commit/b213629fbea6168bb9b7fb6f1cf397311ae1abaa)) as the pre-checked version and number 3 as the checked version. The difference between these two (just Java files): 14 files changed, 301 insertions(+), 63 deletions(-).  Author3: I agree. The key thing here to me is the short timeline: they cycle through these nullness checkers quickly, so there aren't any non-nullness-related commits in-between. That makes this case actually a bit simpler than some of the others, IMO.

**Please add your opinion in this table under your name, especially if you have a different idea.**

**Table-wrapper-api**

|  |  |  |  |
| --- | --- | --- | --- |
| **Author** | **Pre-version** | **Post-version** | **Reason** |
| Author1 | [b213629fbea6168bb9b7fb6f1cf397311ae1abaa](https://github.com/spacious-team/table-wrapper-api/commit/b213629fbea6168bb9b7fb6f1cf397311ae1abaa)  Reconsider: I think pre should be this: [d4e4303c62d13d1ede3ddd8fec70124d65364bb2](https://github.com/spacious-team/table-wrapper-api/commit/d4e4303c62d13d1ede3ddd8fec70124d65364bb2) because it is right before adding the checker and the results for this, unlike the previous one, supports our claim! | [73a0fd50f9bf8a9e2218ba5231b97170b91dd273](https://github.com/spacious-team/table-wrapper-api/commit/73a0fd50f9bf8a9e2218ba5231b97170b91dd273) | Changes are nullness specific. |
| Author2 |  |  |  |
| Author3 | [b213629fbea6168bb9b7fb6f1cf397311ae1abaa](https://github.com/spacious-team/table-wrapper-api/commit/b213629fbea6168bb9b7fb6f1cf397311ae1abaa) | [73a0fd50f9bf8a9e2218ba5231b97170b91dd273](https://github.com/spacious-team/table-wrapper-api/commit/73a0fd50f9bf8a9e2218ba5231b97170b91dd273) | Agree with Author1’s reasoning. I would add that I don’t think the use of two different checkers (FindBugs + CF) is a problem for our argument: both inducing code changes is ok. |
| Author4 |  |  |  |

**For Table-wrapper-csv-impl**:

<https://github.com/spacious-team/table-wrapper-csv-impl/>

1. The same developers from the previous project, after gaining knowledge and experience with CFNullness on 20-Oct-22 in the previous project, added CFNullness dependencies to this project on 23-Oct-22 without adding any new annotations: [095c0d1fde40176d4694e26f74d2785250a15fdc](https://github.com/spacious-team/table-wrapper-csv-impl/commit/095c0d1fde40176d4694e26f74d2785250a15fdc). They just changed the build file.
2. They probably were tired after extensive use of nullability tools in two days 😀, so they delayed checking this project for nullability by adding the first @Nullable annotations on 19-Nov-22: [13dbe59189e6939c835591c844d6a884e8c9ba39](https://github.com/spacious-team/table-wrapper-csv-impl/commit/13dbe59189e6939c835591c844d6a884e8c9ba39), by adding 17 @Nullable annotations, 0 @NonNull, and 0 @SuppressWarnings for nullness.
3. Between these commits (1 and 2), they had 3 commits related to fixing other aspects of their code or adding more features. Author3: looked over these commits, and they're all small and pretty clearly unrelated to nullness. I think we could either include them or not, and it will not make much difference. I'm mildly inclined to include them (i.e., use the commit before 1 as the "pre" commit), but I don't object if you'd prefer the other way.

Based on this story, since there are 3 unrelated commits between adding the CFNullness dependencies and actually using it, it seems better to not consider the version before adding the checker dependencies, but the version right before adding the @Nullable annotations (before number 1: [b5878d3448c7e39424b2e22600e1fc7474246c5b](https://github.com/spacious-team/table-wrapper-csv-impl/commit/b5878d3448c7e39424b2e22600e1fc7474246c5b)) as the pre-checked version since the changes are nullness-specific. We should also usenumber 2 as the checked version since after that they started adding more features to their code and added more @Nullable annotations when they had new code and new features.

**Table-wrapper-csv-impl**

|  |  |  |  |
| --- | --- | --- | --- |
| **Author** | **Pre-version** | **Post-version** | **Reason** |
| Author1 | [b5878d3448c7e39424b2e22600e1fc7474246c5b](https://github.com/spacious-team/table-wrapper-csv-impl/commit/b5878d3448c7e39424b2e22600e1fc7474246c5b)  Reconsider:  [c18002791cc3da4adea9b4c58e846d7faa5b7145](https://github.com/spacious-team/table-wrapper-csv-impl/commit/c18002791cc3da4adea9b4c58e846d7faa5b7145) | [7](https://github.com/spacious-team/table-wrapper-api/commit/73a0fd50f9bf8a9e2218ba5231b97170b91dd273)[13dbe59189e6939c835591c844d6a884e8c9ba39](https://github.com/spacious-team/table-wrapper-csv-impl/commit/13dbe59189e6939c835591c844d6a884e8c9ba39) | Changes seems nullness specific. |
| Author2 |  |  |  |
| Author3 | [c18002791cc3da4adea9b4c58e846d7faa5b7145](https://github.com/spacious-team/table-wrapper-csv-impl/commit/c18002791cc3da4adea9b4c58e846d7faa5b7145) | [7](https://github.com/spacious-team/table-wrapper-api/commit/73a0fd50f9bf8a9e2218ba5231b97170b91dd273)[13dbe59189e6939c835591c844d6a884e8c9ba39](https://github.com/spacious-team/table-wrapper-csv-impl/commit/13dbe59189e6939c835591c844d6a884e8c9ba39) | Differences between c1800 and b5778 are really minor, but could have been inspired by checker runs |
| Author4 |  |  |  |

**jib**

<https://github.com/GoogleContainerTools/jib/tree/master>

1. They added Nullaway and fixed its emitted errors on 14-Mar-18:  23306a36bb8f0585427e2399eb3ee6fba109a019 in which they had 103 @Nullable annotations in the jib-core project for which they had applied nullaway.
2. Before adding Nullaway, in 4005c45ff437973d0481244034f806c7b71164ec, they had 52 @Nullable annotations.

The diff between these two: 32 files changed, 210 insertions(+), 63 deletions(-)

**jib**

|  |  |  |  |
| --- | --- | --- | --- |
| **Author** | **Pre-version** | **Post-version** | **Reason** |
| Author1 | 4005c45ff437973d0481244034f806c7b71164ec | 23306a36bb8f0585427e2399eb3ee6fba109a019 | Changes are checker-specific |
| Author2 |  |  |  |
| Author3 |  |  |  |
| Author4 |  |  |  |