Testing and Code Review

1. Change History

Change Date	Modified Sections	Rationale
Nothing to show		

2. Back-end Test Specification: APIs

2.1. Locations of Back-end Tests and Instructions to Run Them

2.1.1. Tests

Notes API

Interface	Describe Group Location, No Mocks	Describe Group Location, With Mocks
POST /api/notes	backend/src/__tests__/unmocked/notes.normal.test.ts#L40	backend/src/__tests__/mocked/notes.mocked.test.ts#L
PUT /api/notes/:id	#L282	#L202
DELETE /api/notes/:id	#L398	#L298
GET /api/notes/:id	#L462	#L253
GET /api/notes	#L528	#L343
GET /api/notes/:id/workspaces	#L893	#L620
POST /api/notes/:id/share	#L662	#L665
POST /api/notes/:id/copy	#L784	#L764

Workspaces API

Interface	Describe Group Location, No Mocks	Describe Group Location, With Mocks
POST /api/workspace	backend/src/__tests__/unmocked/workspace.normal.test.ts#L45	backend/src/__tests__/mocked/worksp
GET /api/workspace/personal	#L167	#L277
GET /api/workspace/user	#L290	#L330
GET /api/workspace/:id	#L352	#L364
GET /api/workspace/:id/members	#L410	#L398
GET /api/workspace/:id/tags	#L454	#L448
GET /api/workspace/:id/membership/:userId	#L536	#L482
POST /api/workspace/:id/members	#L619	#L516
POST /api/workspace/:id/leave	#L847	#L694
PUT /api/workspace/:id	#L959	#L712
PUT /api/workspace/:id/picture	#L1051	#L748
DELETE /api/workspace/:id/members/:userId	#L1156	#L784
DELETE /api/workspace/:id	#L1323	#L818
GET /api/workspace/:id/poll	#L1429	#L852

Authentication API

Interface	Describe Group Location, No Mocks	Describe Group Location, With Mocks	Mocke
POST /api/auth/signup	backend/src/__tests__/unmocked/auth.normal.test.ts#L123	backend/src/__tests__/mocked/auth.mocked.test.ts#L74	authSe Google worksp
POST /api/auth/signin	#L151	#L290	authS
POST /api/auth/dev-login	#L68	#L394	authS

User API

Interface	Describe Group Location, No Mocks	Describe Group Location, With Mocks
GET /api/users/profile	backend/src/__tests__/unmocked/user.normal.test.ts#L39	—
PUT /api/users/profile	#L57	backend/src/__tests__/mocked/user.mocked.test.ts#L48
DELETE /api/users/profile	#L166	#L104
POST /api/users/fcm-token	#L230	#L155
GET /api/users/:id	#L273	#L209
GET /api/users/email/:email	#L318	#L260

Message API

Interface	Describe Group Location, No Mocks	Describe Group Location, With Mocks
GET /api/messages/workspace/:workspaceId	backend/src/__tests__/unmocked/message.normal.test.ts#L61	backend/src/__tests__/mocked/message.m
POST /api/messages/workspace/:workspaceId	#L188	#L91
DELETE /api/messages/:messageId	#L261	#L134

Media API

Interface	Describe Group Location, No Mocks	Describe Group Location, With Mocks	Moc
POST /api/media/upload	backend/src/__tests__/unmocked/media.normal.test.ts#L56	backend/src/__tests__/mocked/media.mocked.test.ts#L55	stor file s

2.1.2. Commit Hash Where Tests Run

c5f46d61177b82ff74c9c30dfd32a5e24de5d683

2.1.3. How to Run the Tests

1. cd backend
2. npm install
3. npm test

2.2. GitHub Actions Configuration Location

~/.github/workflows/backend-tests.yml

2.3. Jest Coverage Report Screenshots (Without Mocking)

```
-----------------------------|---------|----------|---------|---------|-------------------------------------------
File                         | % Stmts | % Branch | % Funcs | % Lines | Uncovered Line #s
-----------------------------|---------|----------|---------|---------|-------------------------------------------
All files                    |   81.78 |    61.56 |   88.35 |    81.9 |
 asyncHandler.util.ts        |     100 |      100 |     100 |     100 |
 auth.controller.ts          |   43.18 |    23.07 |   66.66 |   43.18 | 23-38,47,53,59,74-106,121-131
 auth.middleware.ts          |   98.14 |      100 |     100 |   98.07 | 68
 auth.routes.ts              |     100 |      100 |     100 |     100 |
 auth.service.ts             |   43.63 |    11.11 |      50 |   43.63 | 17-40,47,53,59-96
 auth.types.ts               |     100 |      100 |     100 |     100 |
 constants.ts                |     100 |      100 |     100 |     100 |
 database.ts                 |       0 |        0 |       0 |       0 | 1-44
 errorHandler.middleware.ts  |     100 |      100 |     100 |     100 |
 logger.util.ts              |     100 |       50 |     100 |     100 | 7-11
 media.controller.ts         |   94.11 |       80 |     100 |   94.11 | 48
 media.routes.ts             |     100 |      100 |     100 |     100 |
 media.service.ts            |   89.28 |    78.26 |     100 |   89.09 | 72,81,104-105,112,128
 message.model.ts            |     100 |      100 |     100 |     100 |
 message.routes.ts           |   86.95 |    76.92 |     100 |   86.95 | 18,53-54,64,98-99,109,130-131
 message.types.ts            |     100 |      100 |     100 |     100 |
 note.model.ts               |     100 |      100 |     100 |     100 |
 notes.controller.ts         |   82.11 |       50 |     100 |   82.11 | ...6-27,35-36,60-61,81-82,98-99,107-108,141,149-150,175-176,183,206-207
 notes.routes.ts             |     100 |      100 |     100 |     100 |
 notes.service.ts            |   73.45 |     65.9 |   76.47 |   76.69 | 40,146,161,221,251-287
 notes.types.ts              |     100 |      100 |     100 |     100 |
 notification.service.ts     |      65 |    33.33 |      50 |      65 | 7,46-63
 routes.ts                   |     100 |      100 |     100 |     100 |
 sanitizeInput.util.ts       |     100 |      100 |     100 |     100 |
 storage.ts                  |   94.73 |    66.66 |     100 |   94.73 | 13
 user.controller.ts          |   65.43 |       12 |     100 |   65.43 | 15-16,33,39,49-57,65,91-99,107,117,126-134,161-169,178,196-204
 user.model.ts               |    75.4 |       80 |      90 |    75.4 | 113-114,122-123,137-138,146-162
 user.routes.ts              |     100 |      100 |     100 |     100 |
 user.types.ts               |     100 |      100 |     100 |     100 |
 validation.middleware.ts    |   91.66 |      100 |     100 |    90.9 | 23
 workspace.controller.ts     |   82.95 |    54.44 |     100 |   82.95 | ...-286,321,329-330,370,378-379,409,417-418,449,457-458,489,496-497,517
 workspace.model.ts          |     100 |      100 |     100 |     100 |
 workspace.routes.ts         |     100 |      100 |     100 |     100 |
 workspace.service.ts        |   99.46 |    97.91 |     100 |   99.42 | 50
 workspace.types.ts          |     100 |      100 |     100 |     100 |
-----------------------------|---------|----------|---------|---------|-------------------------------------------

Test Suites: 6 passed, 6 total
Tests:       218 passed, 218 total
Snapshots:   0 total
Time:        8.724 s, estimated 15 s
Ran all test suites matching /__tests__\/unmocked/i.
```

2.4. Jest Coverage Report Screenshots (With Mocking)

```
-----------------------------|---------|----------|---------|---------|-------------------------------------------    Add to Chat ⌘L
File                         | % Stmts | % Branch | % Funcs | % Lines | Uncovered Line #s
-----------------------------|---------|----------|---------|---------|-------------------------------------------
All files                    |   71.61 |    57.22 |   69.17 |   71.99 |
 asyncHandler.util.ts        |      75 |      100 |   66.66 |     100 |
 auth.controller.ts          |     100 |     92.3 |     100 |     100 | 112
 auth.middleware.ts          |   38.88 |        0 |      50 |   36.53 | 18-22,27-31,41-45,53-57,61-65,79-120
 auth.routes.ts              |     100 |      100 |     100 |     100 |
 auth.service.ts             |   92.72 |    88.88 |     100 |   92.72 | 108-109,126-127
 auth.types.ts               |     100 |      100 |     100 |     100 |
 constants.ts                |     100 |      100 |     100 |     100 |
 database.ts                 |     100 |      100 |     100 |     100 |
 errorHandler.middleware.ts  |    90.9 |      100 |      50 |   88.88 | 6
 logger.util.ts              |     100 |      100 |     100 |     100 |
 media.controller.ts         |   88.23 |       60 |     100 |   88.23 | 16,24
 media.routes.ts             |     100 |      100 |     100 |     100 |
 media.service.ts            |   80.35 |    65.21 |      80 |   81.81 | 22,34,45,96,102,116-124
 message.model.ts            |     100 |      100 |     100 |     100 |
 message.routes.ts           |   81.15 |    23.07 |     100 |   81.15 | 24,31,35,41,51,70,77,81,96,114,120,124,128
 message.types.ts            |     100 |      100 |     100 |     100 |
 note.model.ts               |     100 |      100 |     100 |     100 |
 notes.controller.ts         |   79.67 |       75 |     100 |   79.67 | ...121,129-130,137-138,157-158,163,171-172,179-180,192,215-216,219-220
 notes.routes.ts             |     100 |      100 |     100 |     100 |
 notes.service.ts            |   67.25 |    56.81 |    64.7 |   66.01 | 58,70-107,122,125,131,137,149,163-207,227,236,243
 notes.types.ts              |     100 |      100 |     100 |     100 |
 notification.service.ts     |     100 |      100 |     100 |     100 |
 routes.ts                   |     100 |      100 |     100 |     100 |
 sanitizeInput.util.ts       |   88.88 |        0 |     100 |   83.33 | 7
 storage.ts                  |   94.73 |    66.66 |     100 |   94.73 | 39
 user.controller.ts          |    75.3 |       88 |     100 |    75.3 | 19,44,70-86,120-121,143,150-156,185-191
 user.model.ts               |   73.77 |       20 |      90 |   73.77 | 85-90,102-111,132,188-206
 user.routes.ts              |     100 |      100 |     100 |     100 |
 user.types.ts               |     100 |      100 |     100 |     100 |
 validation.middleware.ts    |   83.33 |        0 |   66.66 |   81.81 | 13-16
 workspace.controller.ts     |   71.59 |    65.55 |     100 |   71.59 | ...404-405,431,440-441,444-445,467,476-477,480-481,484-485,503,512-513
 workspace.model.ts          |     100 |      100 |     100 |     100 |
 workspace.routes.ts         |     100 |      100 |     100 |     100 |
 workspace.service.ts        |    21.5 |    10.41 |   15.78 |   21.96 | 13-38,53-118,130,138-189,196,202,208,214,220,226,255,271-477
 workspace.types.ts          |     100 |      100 |     100 |     100 |
-----------------------------|---------|----------|---------|---------|-------------------------------------------

Test Suites: 6 passed, 6 total
Tests:       184 passed, 184 total
Snapshots:   0 total
Time:        17.137 s, estimated 27 s
Ran all test suites matching /__tests__\/mocked/i.
```

2.5. Combined Jest Coverage Reports (With & Without Mocking)

```
────────────────────────────┬──────────┬──────────┬──────────┬──────────┬─────────────────────
 File                        │ % Stmts  │ % Branch │ % Funcs  │ % Lines  │ Uncovered Line #s
────────────────────────────┼──────────┼──────────┼──────────┼──────────┼─────────────────────
 All files                   │    100   │    100   │    100   │    100   │
  asyncHandler.util.ts       │    100   │    100   │    100   │    100   │
  auth.controller.ts         │    100   │    100   │    100   │    100   │
  auth.middleware.ts         │    100   │    100   │    100   │    100   │
  auth.routes.ts             │    100   │    100   │    100   │    100   │
  auth.service.ts            │    100   │    100   │    100   │    100   │
  auth.types.ts              │    100   │    100   │    100   │    100   │
  constants.ts               │    100   │    100   │    100   │    100   │
  database.ts                │    100   │    100   │    100   │    100   │
  errorHandler.middleware.ts │    100   │    100   │    100   │    100   │
  logger.util.ts             │    100   │    100   │    100   │    100   │
  media.controller.ts        │    100   │    100   │    100   │    100   │
  media.routes.ts            │    100   │    100   │    100   │    100   │
  media.service.ts           │    100   │    100   │    100   │    100   │
  message.model.ts           │    100   │    100   │    100   │    100   │
  message.routes.ts          │    100   │    100   │    100   │    100   │
  message.types.ts           │    100   │    100   │    100   │    100   │
  note.model.ts              │    100   │    100   │    100   │    100   │
  notes.controller.ts        │    100   │    100   │    100   │    100   │
  notes.routes.ts            │    100   │    100   │    100   │    100   │
  notes.service.ts           │    100   │    100   │    100   │    100   │
  notes.types.ts             │    100   │    100   │    100   │    100   │
  notification.service.ts    │    100   │    100   │    100   │    100   │
  routes.ts                  │    100   │    100   │    100   │    100   │
  sanitizeInput.util.ts      │    100   │    100   │    100   │    100   │
  storage.ts                 │    100   │    100   │    100   │    100   │
  user.controller.ts         │    100   │    100   │    100   │    100   │
  user.model.ts              │    100   │    100   │    100   │    100   │
  user.routes.ts             │    100   │    100   │    100   │    100   │
  user.types.ts              │    100   │    100   │    100   │    100   │
  validation.middleware.ts   │    100   │    100   │    100   │    100   │
  workspace.controller.ts    │    100   │    100   │    100   │    100   │
  workspace.model.ts         │    100   │    100   │    100   │    100   │
  workspace.routes.ts        │    100   │    100   │    100   │    100   │
  workspace.service.ts       │    100   │    100   │    100   │    100   │
  workspace.types.ts         │    100   │    100   │    100   │    100   │
────────────────────────────┴──────────┴──────────┴──────────┴──────────┴─────────────────────
Test Suites: 13 passed, 13 total
Tests:       403 passed, 403 total
Snapshots:   0 total
Time:        35.87 s
Ran all test suites.
```

3. Back-end Non-functional Requirements

3.1. Test Locations

Non-Functional Requirement	Location in Git
Backend – Search Speed	ThingSpace.ts/backend/src/__tests__/notes.latency.test.ts
Frontend – Two-Click Navigation	frontend/app/src/androidTest/java/com/cpen321/usermanagement/TestReachWithTwoClicks.kt

Backend – Search Speed (`notes.latency.test.ts`)

- **How to run:** `cd backend && npm test -- __tests__/non-func-tests`
- **What it checks:** Seeds 400 notes, issues three representative search queries, and reports the mean latency. Latest runs average ~1.1s/query, comfortably under the 5s budget.

Frontend – Two-Click Navigation (`TestReachWithTwoClicks.kt`)

- **How to run:** `cd frontend && ./gradlew connectedAndroidTest -Pandroid.testInstrumentationRunnerArguments.class=com.cpen321.usermanagement.TestReachWithTwoClicks`
- **What it checks:** Starting from the main workspace screen, the test traverses to note, template, and chat views—both within the current workspace and across other workspaces—counting taps to confirm every note-bearing screen is reachable in ≤2 clicks.

3.2. Test Verification and Logs

Performance: Search Speed

- Creates 400 notes, runs 3 queries, average ~1.1s (<5s target)
- Logs:

Chat Data Security

- Verification:
- Logs:

---

4. Front-end Test Specification

This includes the non-functional requirement that every note/message containing screen must be reachable from the main screen within two clicks. This non-functional requirement can only be verified via frontend tests, hence it is included here as `TestReachWith2Clicks.kt`.

4.1. Location in Git

`./frontend/app/src/androidTest/java/com.cpen321.usermanagement`

4.2. Tests Included

Test of the "Collaborate" Feature (`TestCollaborate.kt`)

Prerequisite:

1. Need 2 user accounts:
   - Workspace Manager
   - Workspace Member
2. Workspace Manager must have a workspace named **"Test"**
3. There must be **no existing workspaces** named *"Study"* or *"Study v2"*

Scenario Steps and Test Case Steps

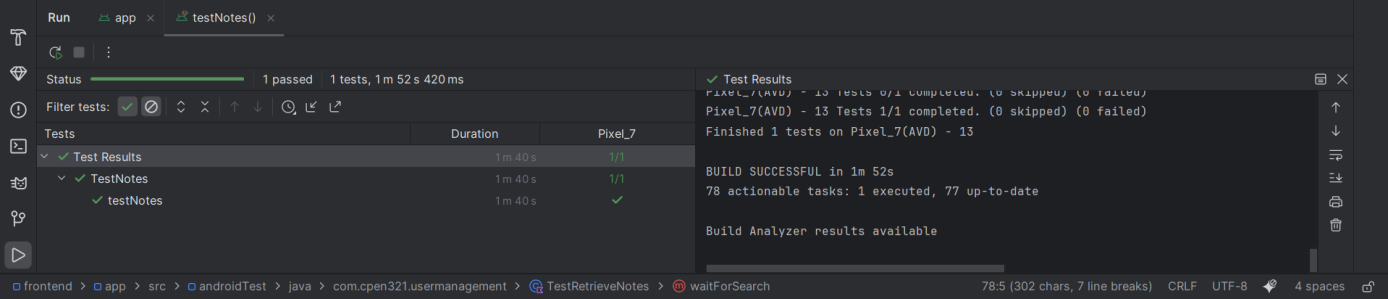| Scenario Steps	Test Case Steps
Create Workspace	
1. The user opens the "Create Workspace" screen.	Open the "Create Workspace" screen.
2. The app shows input fields and a disabled button.	Verify "Pick a workspace name" and disabled "Create Workspace" button.
3a. User enters workspace title already taken.	Pre-create workspace "Test". Enter "Test" and click Create.
3a1. App shows error.	Check for dialog: **"Failed to create workspace."**
3. User enters valid title.	Enter "Studies". Verify "Create" button enabled.
4. User clicks "Create".	Click "Create". Verify workspace setup screen shown and "Studies" appears in list.
Update Workspace	
10. Manager navigates to "Edit Workspace".	As manager, open workspace → click pencil icon.
11. Edit title and bio.	Change title to "Studies v2" and bio "Study group"; click Save; expect "Profile updated successfully."
Invite to Workspace	
5. Member selects "Invite User".	Open Studies → Manage Workspace → Invite icon.
6. App shows input and button.	Verify email field + "Invite to Workspace" button visible.
7a. Enter invalid email.	Enter "invalidemail", click Invite.
7a1. Error message shown.	Check: **"Could not retrieve profile matching the given email!"**
7. Enter valid email.	Input teammate email → click Invite → expect **"The user got added to the workspace."**
7b. Invite already-member user.	Enter existing member email and click Invite.
7b1. Error message.	**"The user is already a member!"**
Send Chat Message	
8. User opens workspace chat.	Open chat icon; verify chat screen shown.
9a. Empty message.	Send blank message; verify no change.
9. Valid message.	Send "Hello team!"; verify appears with picture & timestamp.
Update Workspace as Non-Manager	
10a. Non-manager tries editing workspace.	Open edit screen as non-manager → fields should be greyed out.
Leave Workspace (Non-Manager)	
12. Non-manager clicks Leave.	Open Studies → Leave Workspace.
13. App removes user.	Studies no longer appears in workspace list.
Ban Users	
14. Manager opens Members screen.	Manage Workspace → Members icon.

Scenario Steps	Test Case Steps
15. Manager bans user.	Click trash next to user.
16. User banned permanently.	User removed, cannot be re-invited → **"This user is banned"**
Delete Workspace	
17. Manager deletes workspace.	Click Delete Workspace (trash icon).
18. Workspace deleted.	Studies disappears and name can be used again.

Test of the "Manage Notes" Feature (`TestNotes.kt`)

Prerequisite:
Two pre-existing workspaces.

Scenario Steps	Test Case Steps
Create Note	
1. Open "Create Note" screen.	Tap pencil icon.
2. App shows metadata fields and create button.	Verify "Note Type", "Tags", "Fields".
3a. Create note with no fields.	Click Create with no fields.
3a1. Error.	**"Please add at least one field"**
3b. Create note with empty field label.	Add field but leave label blank; click Create.
3b1. Error.	**"All fields must have a label"**
3. User fills fields.	Add tag(s), add field "Notes", enter content.
4. Click Create.	
5. Note created.	Verify note appears.
Update Note	
6. Open note to edit.	Click pencil icon on note.
7. App shows editable fields.	Verify tag add/remove.
8. Modify content & tags.	
9. Click Save.	
10. Note updated.	Verify new values.
Share Note	
11. Select "Share Note".	Click Share icon.
12. Workspace selection dialog.	Verify "Share Note" + workspace list.
13. Select workspace & confirm.	Click Share.
14. Note shared.	**"Note shared to workspace successfully"**, note moves workspaces.
Copy Note	
15. Select "Copy Note".	Click Copy icon.
16. Workspace selection.	Verify UI.
17. Select workspace.	Click Copy.
18. Note copied.	Appears in both workspaces.
Delete Note	
19. Select "Delete Note".	Tap trash.
20. Confirmation dialog.	**"Are you sure… cannot be undone"**
21. Confirm.	Click Delete.
22. Note deleted.	Verify removal.

## Test of the "Retrieve Notes" Feature (`TestRetrieveNotes.kt`)

Prerequisite:
Existing workspace with notes.

| Scenario Steps	Test Case Steps
Search Notes	
1. Open workspace.	Navigate to workspace.
2. Search bar visible.	Verify presence.
3a. Empty query.	Search blank.
3a1. All notes shown.	Verify list.
3. Enter query.	Input string → Search.
4. Matching notes shown.	Relevant notes at top.
Filter Notes by Tags	
5. Click filter icon.	
6. Tag selection screen.	Verify "All" + checkboxes.
7. Select "All".	All tags selected.
9. Deselect "All".	All tags cleared.
11. Select specific tags.	
12. Go back.	
13. Filter applied.	Only matching notes.
Combined Search + Filter	
14. Enter search + choose tags.	
15. Results match both filters.	Matching notes displayed.
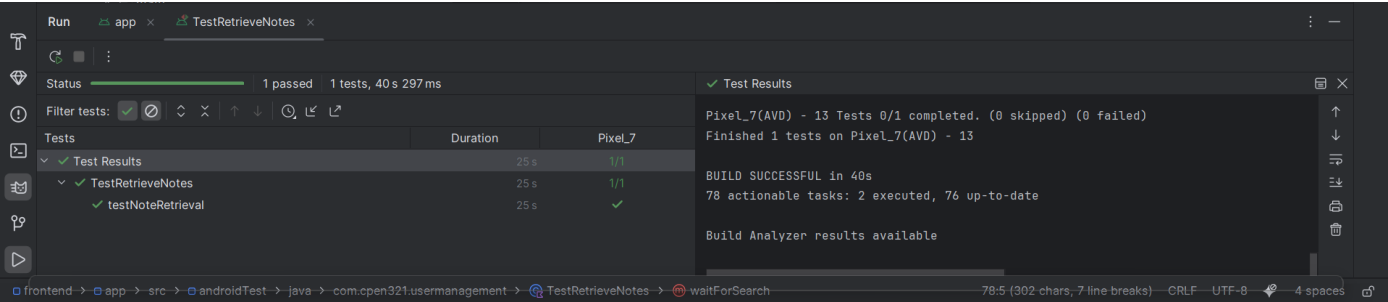
Test: Reach Note Screens in ≤2 Clicks (`TestReachWith2Clicks.kt`)

This test verifies that from a workspace main screen, users can reach:

- templates screen
- chat screen
- content/templates/chat of another workspace

All screens must be reachable in **2 clicks or fewer**.

The test counts the number of clicks for each navigation path.

Test Logs
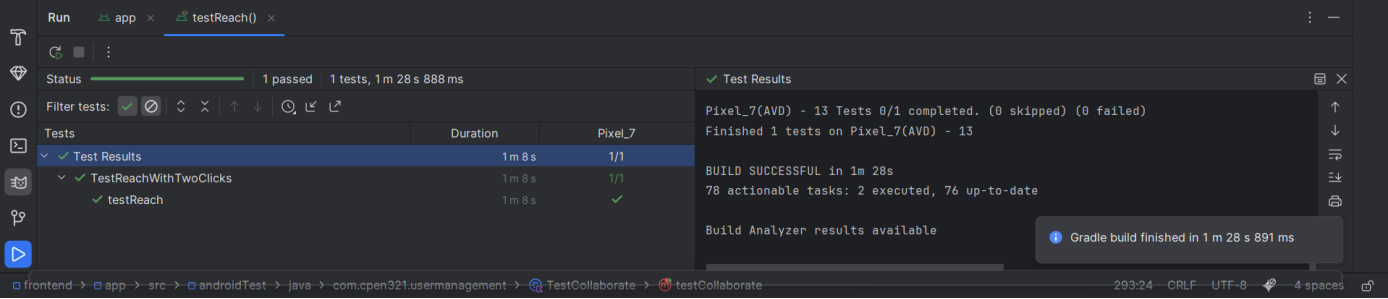
5. Automated Code Review Results

5.1. Commit Hash Where Codacy Ran

`c5f46d61177b82ff74c9c30dfd32a5e24de5d683`

5.2. Unfixed Issues per Codacy Category

5.3. Unfixed Issues per Codacy Code Pattern

Issues

ⓘ **Current** 0	⊘ Ignored 0

▽ Filter by | Languages ⌄ | Severities ⌄ | Categori...

All issues   0

5.4. Justifications for Unfixed Issues

- **Usage of Deprecated Modules**
  - Location: `src/services/chatService.js#L31`
  - Justification: