Behavioral Testing Guide

Finanzas SD – Architecture, Flows & SOPs

Arquitectura, Flujos y Procedimientos

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1 Behavioral Testing Guide

This document describes the behavioral testing protocol for the Finanzas SD application, including API tests, UI tests, and security validations.

1.1 Overview

The behavioral testing protocol validates: 1. **API Reachability & Auth** - Cognito authentication works and API responds 2. **CORS Preflight** - CloudFront SPA origin is properly configured 3. **RBAC Enforcement** - Backend enforces role-based access control 4. **UI Behavior** - Frontend routing, navigation, and data state handling 5. **Security** - NO_GROUP users are denied access (prevents role leakage) 6. **Data Shape Contracts** - API responses match expected schemas

1.2 Key Principles

- **No Seeded Data Required** - Tests discover real data and handle empty states
- **Real Authentication** - Tests use actual Cognito users with different roles
- **Behavioral Validation** - Tests validate behavior, not implementation details
- **Security First** - NO_GROUP user validation prevents unauthorized access

1.3 Test Suites

1.3.1 1. Behavioral API Tests (Blocking on PR)

Location: `tests/behavioral-api/`

These tests run on every PR and validate:

Health/Smoke Tests (`health.test.ts`)

- API base URL is configured and reachable
- Cognito authentication works
- JSON responses are parseable
- CORS headers present on actual requests

CORS Preflight Tests (`cors.test.ts`)

- OPTIONS preflight requests return correct headers
- CloudFront origin is allowed
- Required methods (GET, POST, PATCH) are allowed
- Required headers (authorization, content-type) are allowed
- Tests all critical endpoints:
  - `/projects`

- `/plan/forecast`
- `/catalog/rubros`
- `/line-items`
- `/allocation-rules`
- `/providers`

RBAC Enforcement Tests (`rbac.test.ts`)

- **PMO** users can access PMO endpoints
- **SDM_FIN** users can access finance endpoints
- **SDMT** users can access SDMT endpoints
- **EXEC_RO** users have read-only access
- **NO_GROUP** users are denied all protected endpoints (CRITICAL)

Schema Validation Tests (`schema.test.ts`)

- `/projects` returns `{ data: array, total: number }`
- Each project has `projectId`, `code`, `name`, `client`
- `/plan/forecast` returns `{ projectId, data: array }`
- `/catalog/rubros` returns array of rubros
- Empty responses handled gracefully (no 500 errors)

1.3.2 2. Playwright UI Tests (Non-blocking, Manual/Nightly)

Location: `tests/e2e/behavioral/`

These tests validate UI behavior:

Routing RBAC Tests (`routing-rbac.spec.ts`)

- **NO_GROUP** users redirected or denied access
- **SDMT** users can access SDMT routes
- **SDM_FIN** users can access finance routes
- **EXEC_RO** users see all routes but actions are disabled
- **PMO** users blocked from SDMT-only routes

UI Data State Tests (`ui-data-state.spec.ts`)

- Empty states shown clearly when no data
- Charts don’t render misleading empty visuals
- Populated data displayed correctly
- Loading indicators shown during fetch
- Error states handled gracefully

1.4 Running Tests Locally

1.4.1 Prerequisites

1. **Environment Variables**

   Create `.env.local` with:

```
[] # API Configuration FINZ_API_BASE=https://pyorjw6lbe.execute-api.us-east-2.amazonaws.com
CF_DOMAIN=https://d7t9x3j66yd8k.cloudfront.net
# Cognito Configuration AWS_REGION=us-east-2 COGNITO_USER_POOL_ID=us-east-
2_FyHLtOhiY COGNITO_WEB_CLIENT=dshos5iou44tuach7ta3ici5m COGNITO_REGION=us-
east-2
# UI Configuration (for Playwright tests) FINZ_UI_BASE_URL=https://d7t9x3j66yd8k.cloudfront.ne
```

2. **Test Credentials**

   For behavioral tests, configure credentials for each role:

```
[] # PMO Role E2E_PMO_EMAIL=pmo-user@example.com E2E_PMO_PASSWORD=SecurePasswor
# SDMT Role (also used for SDM_FIN tests) E2E_SDMT_EMAIL=sdmt-user@example.com
E2E_SDMT_PASSWORD=SecurePassword123!
# EXEC_RO Role E2E_EXEC_EMAIL=exec-user@example.com E2E_EXEC_PASSWORD=SecurePass
# NO_GROUP User (CRITICAL for security testing) E2E_NO_GROUP_EMAIL=no-group-
user@example.com E2E_NO_GROUP_PASSWORD=SecurePassword123!
```

⚠ **Important**: The NO_GROUP user must exist in Cognito but **must not** be assigned to any groups. This validates that users without groups are properly denied access.

1.4.2 Running API Tests

```
[] # Run all behavioral API tests npm run test:behavioral
# Run specific test suite npx tsx --test tests/behavioral-api/health.test.ts npx tsx --
test tests/behavioral-api/cors.test.ts npx tsx --test tests/behavioral-api/rbac.test.ts npx
tsx --test tests/behavioral-api/schema.test.ts
```

1.4.3 Running UI Tests

```
[] # Install Playwright browsers (first time only) npx playwright install chromium
# Run all UI behavioral tests npm run test:ui
# Run in headed mode (see browser) npx playwright test tests/e2e/behavioral --
headed
# Run specific test file npx playwright test tests/e2e/behavioral/routing-rbac.spec.ts
# View HTML report npx playwright show-report
```

1.5 CI/CD Integration

1.5.1 Behavioral API Tests (Blocking)

Workflow: `.github/workflows/behavioral-api-tests.yml`

Triggers: - Pull requests to `main`/`develop` - Push to `main`/`develop` - Manual workflow dispatch

Required Secrets (configure in GitHub repo settings): - `E2E_PMO_EMAIL` / `E2E_PMO_PASSWORD` - `E2E_SDMT_EMAIL` / `E2E_SDMT_PASSWORD` - `E2E_EXEC_EMAIL` / `E2E_EXEC_PASSWORD` - `E2E_NO_GROUP_EMAIL` / `E2E_NO_GROUP_PASSWORD` (CRITICAL)

Evidence: Test output prints endpoint name, HTTP status, role, and pass/fail for each test.

1.5.2 UI Playwright Tests (Non-blocking)

Workflow: `.github/workflows/ui-playwright.yml`

Triggers: - Manual workflow dispatch - Nightly schedule (2 AM UTC)

Artifacts: - Playwright HTML report - Screenshots/videos of failures - Test results JSON

1.6 Configuring Test Users in Cognito

1.6.1 Automated Setup (Recommended)

Use the provided script to create all test users at once:

```
[] # Ensure AWS credentials are configured (via aws configure, SSO, or env vars)
./scripts/cognito/setup-test-users.sh
```

This script will: - Create users for PMO, SDMT, EXEC_RO, and NO_GROUP roles - Set passwords to `SecureTestPass2025!` - Assign appropriate Cognito groups - Verify NO_GROUP user has zero group memberships

After running the script, add the credentials to `.env.local` or GitHub Actions secrets as shown in the script output.

1.6.2 Manual Setup

Alternatively, create test users manually:

Creating Test Users For each role, create a user in Cognito:

```
[] aws cognito-idp admin-create-user \ --user-pool-id us-east-2_FyHLtOhiY \ --username
"pmo-test@example.com" \ --user-attributes Name=email,Value="pmo-test@example.com"
\ --temporary-password "TempPassword123!" \ --region us-east-2
# Set permanent password aws cognito-idp admin-set-user-password \ --user-pool-
id us-east-2_FyHLtOhiY \ --username "pmo-test@example.com" \ --password "SecurePass-
word123!" \ --permanent \ --region us-east-2
```

1.6.3 Assigning Groups

Assign users to appropriate Cognito groups:

```
[] # PMO user aws cognito-idp admin-add-user-to-group \ --user-pool-id us-east-
2_FyHLtOhiY \ --username "pmo-test@example.com" \ --group-name PMO \ --region
us-east-2
# SDMT user (add to SDT, FIN, or AUD group) aws cognito-idp admin-add-user-to-
group \ --user-pool-id us-east-2_FyHLtOhiY \ --username "sdmt-test@example.com" \
--group-name SDT \ --region us-east-2
# EXEC_RO user aws cognito-idp admin-add-user-to-group \ --user-pool-id us-east-
2_FyHLtOhiY \ --username "exec-test@example.com" \ --group-name EXEC_RO \ --region
us-east-2
# NO_GROUP user - DO NOT add to any group! # This user must have zero group
memberships
```

1.6.4 Verifying Group Membership

```
[] aws cognito-idp admin-list-groups-for-user \ --user-pool-id us-east-2_FyHLtOhiY \
--username "no-group-test@example.com" \ --region us-east-2
# Should return empty Groups array: # { # "Groups": [] # }
```

1.7 Security: NO_GROUP User Validation

The most critical security test is the NO_GROUP user validation:

1.7.1 Why It's Important

Previously, users with no Cognito groups were silently granted EXEC_RO role by default. This is a **security vulnerability** because: - Any authenticated user could access protected data - Role-based access control was effectively bypassed - Users could see data they shouldn't have access to

1.7.2 The Fix

The security fix ensures: 1. `mapGroupsToRoles()` returns **empty array** for users with no groups 2. `getAvailableRoles()` returns **empty array** (no EXEC_RO fallback) 3. UI shows "no access" message for users with empty roles 4. API backend denies access (401/403) for users with no valid groups

1.7.3 Test Validation

The behavioral tests validate:

```
[] // API Test const credentials = getRoleCredentials("NO_GROUP"); const token = await getCognitoToken(credentials); const result = await apiRequest("/projects", token);
// MUST return 401 or 403, NEVER 200 assert.ok(result.status === 401 || result.status === 403);
// UI Test await setupAuthenticatedPage(page, credentials); await page.goto("/projects");
// MUST redirect to login or show access denied const isBlocked = url.includes("/login") || content.includes("access denied"); assert.ok(isBlocked);
```

1.8 Troubleshooting

1.8.1 Common Issues

"Authentication failed" errors **Cause**: Invalid credentials or user not confirmed **Solution**: - Verify credentials in `.env.local` - Confirm user in Cognito console - Check user is not in "FORCE_CHANGE_PASSWORD" status

CORS preflight failures **Cause**: CloudFront origin not configured in API **Solution**: - Verify API Gateway CORS settings - Check CloudFront origin is in allowed origins list - Ensure headers include `authorization` and `content-type`

NO_GROUP tests fail with 200 status **Cause**: Security vulnerability - user granted access without groups **Solution**: - Verify `mapGroupsToRoles()` returns empty array -

Check `getAvailableRoles()` has no EXEC_RO fallback - Review backend RBAC implementation

Tests skip due to missing credentials **Cause**: Role credentials not configured **Solution**: Add `E2E_*_EMAIL` and `E2E_*_PASSWORD` to environment

1.9 Best Practices

1. **Keep NO_GROUP User Clean**: Never add the NO_GROUP test user to any Cognito groups
2. **Test with Real Data**: Don't rely on seeded/canonical data - tests should work with production data
3. **Validate Both API and UI**: Backend and frontend RBAC should match
4. **Monitor Security Tests**: NO_GROUP tests are critical - never skip them
5. **Evidence Logging**: Always print test evidence (endpoint, status, role, result)

1.10 Related Documentation

- Authentication Flow
- Auth Validation Guide
- API Contract Tests
- Playwright Configuration