### 14 - Sync Testing & QA Tools

\*\*14.1 Test Environment Setup\*\*

- Separate sandbox HQ and Shop instances for integration testing.

- Dummy data sets to simulate typical sync loads.

\*\*14.2 Log Simulation Generator\*\*

- Tool to auto-generate fake transactions for:

- Sales

- Inventory changes

- Loyalty activities

- Useful for load testing and edge case validation.

\*\*14.3 Manual Sync Trigger Utility\*\*

- Developer panel to manually trigger:

- Push logs to HQ

- Pull config from HQ

- Re-run failed sync batches

\*\*14.4 Sync History Viewer\*\*

- Visual timeline of sync actions.

- Filters for date, type, status, and user.

- Click to expand payload and view raw JSON.

\*\*14.5 Conflict Simulation Panel\*\*

- Inject artificial data conflicts (e.g., outdated prices or deleted stock entries).

- Validate how conflict resolver UI and logic behave.

\*\*14.6 Error Code Reference\*\*

- Standardized sync error codes (e.g., `E101`, `E204`, `W301`).

- Linked documentation explaining meaning and resolution steps.

\*\*14.7 Developer QA Scripts\*\*

- Automated test scripts for:

- Verifying sync after bulk edits

- Ensuring retry engine triggers correctly

- Backup file generation and restore

\*\*14.8 CI/CD Integration\*\*

- Sync logic included in automated test pipelines.

- Test run results visible from deployment logs.