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## SSB Retuning Automations - User Guide



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## Technical User Guide — SSB Retuning Automations

### 1 Tool overview

**SSB Retuning Automations** is an automation platform for SSB retuning projects that can run in GUI or CLI mode or through a Web Interface (using a server/client infrastructure) and orchestrates five functional modules:

- **Module 0:** Update Network Frequencies.
- **Module 1:** Configuration Audit & Logs Parser.
- **Module 2:** Consistency Check (manual Pre/Post).
- **Module 3:** Consistency Check Bulk (automatic Pre/Post detection by market).
- **Module 4:** Final Clean-Up.

The main execution lives in "src/SSB\_RetuningAutomations.py", where CLI arguments, GUI, configuration persistence, input resolution (folders/ZIP), per-module execution, and artifact versioning are managed.

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## 2 Repository technical architecture

### 2.1 Main files

#### 2.1.1 Orchestration core

- "src/SSB\_RetuningAutomations.py": entry point, CLI/GUI parsing, module routing, batch/bulk execution, and versioning.

#### 2.1.2 Main modules files

- "src/modules/ConfigurationAudit/ConfigurationAudit.py": log parsing and audit workbook construction (Excel + PPT).
- "src/modules/ConfigurationAudit/ca\_summary\_excel.py": assembly of "SummaryAudit" and discrepancy dataframes.
- "src/modules/ConsistencyChecks/ConsistencyChecks.py": PRE/POST loading, relation comparison, discrepancies, and output export.
- "src/modules/ProfilesAudit/ProfilesAudit.py": profiles audit (integrated into module 1).
- "src/modules/CleanUp/FinalCleanUp.py": final clean-up (base implementation for extension).

#### 2.1.3 Common layer and utilities

- "src/modules/Common/\*.py": correction command logic and shared functions.
- "src/utills/\*.py": IO, parsing, frequency handling, Excel, pivots, sorting, infrastructure, and timing.

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## 3 Inputs, outputs, and content per module

### 3.1 Module 0 — Update Network Frequencies

#### 3.1.1 Input

- Input folder (may contain subfolders/ZIPs already supported by the IO layer).
- Logs with an "NRFrequency" table and the "arfcnValueNRDI" column.

#### 3.1.2 Process

1. Scan logs and detects "NRFrequency" blocks.
2. Extracts numeric values from "arfcnValueNRDI".
3. Removes duplicates and sorts frequencies.
4. Updates the persisted "Network frequencies" configuration for GUI/CLI.

#### 3.1.3 Output

- Does not generate Excel/PPT.
- Updates the persisted network frequency value used for filtering and selection in later runs.

### 3.2 Module 1 — Configuration Audit & Logs Parser

#### 3.2.1 Inputs

- Input folder with logs (".log", ".logs", ".txt") or ZIPs resolvable by utilities.
- Frequency parameters:
  - "n77\_ssb\_pre"
  - "n77\_ssb\_post"
  - "n77b\_ssb"
  - allowed SSB/ARFCN lists pre/post.
  - Flags:
    - "profiles\_audit"
    - "frequency\_audit"

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- "export\_correction\_cmd"
- "fast\_excel\_export".

### 3.2.2 Process

1. Parses files and extracts MO tables by "SubNetwork" blocks.
2. Generates one sheet per detected table.
3. Builds "SummaryAudit" + pivots/auxiliary summaries.
4. Runs profiles audit if enabled.
5. Exports CA correction commands if requested.
6. Generates the summary PPT.

### 3.2.3 Outputs

- Folder "ConfigurationAudit\_<timestamp>\_v<version>/".
- Excel file "ConfigurationAudit\_<timestamp>\_v<version>.xlsx":
  - Sheets for each parsed MO table.
  - "SummaryAudit".
  - NR/LTE parameter discrepancy sheets.
  - Summary/pivot sheets by frequencies and relations.
- PPT file "ConfigurationAudit\_<timestamp>\_v<version>.pptx".
- Optional folder "Correction\_Cmd\_CA/" with AMOS commands.

### 3.2.4 Main semantic content

- **SummaryAudit** contains rows with:
  - "Category", "SubCategory", "Metric", "Value", "ExtraInfo",
  - and execution context fields (stage, module, etc. depending on the flow).
  - "Value" usually represents a count of impacted nodes/cells/relations.
  - "ExtraInfo" contains the NodeId list or a compact discrepancy detail.

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### 3.3 Module 2 — Consistency Check (Pre/Post)

#### 3.3.1 Inputs

- "input\_pre" and "input\_post" (or equivalent resolved structure).
- Frequencies "n77\_ssb\_pre" and "n77\_ssb\_post".
- Optional reference to PRE and POST "ConfigurationAudit" to enrich target classification.
- Optional list of frequency filters ("cc\_freq\_filters").

#### 3.3.2 Process

1. Loads relation tables ("GUtranCellRelation", "NRCellRelation").
2. Normalizes columns/keys and selects the most recent snapshots by date.
3. Detect:
  - new relations,
  - missing relations,
  - parameter discrepancies,
  - frequency discrepancies,
  - summary by PRE/POST frequency pair.
4. Classify destination targets as "SSB-Pre", "SSB-Post" or "Unknown".
5. Exports detailed Excel outputs and correction commands.

#### 3.3.3 Outputs

- "CellRelation\_<timestamp>\_v<version>.xlsx" (end-to-end relations view).
- "ConsistencyChecks\_CellRelation\_<timestamp>\_v<version>.xlsx" with:
  - "Summary"
  - "SummaryAuditComparisson" (if there is PRE/POST SummaryAudit)
  - "Summary\_CellRelation"
- GU blocks: "GU\_relations", "GU\_param\_disc", "GU\_freq\_disc", "GU\_freq\_disc\_unknown", "GU\_missing", "GU\_new"
- NR blocks: "NR\_relations", "NR\_param\_disc", "NR\_freq\_disc", "NR\_freq\_disc\_unknown", "NR\_missing", "NR\_new"



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- optional "GU\_all", "NR\_all".
- "Correction\_Cmd\_CC/" with commands per type (new/missing/discrepancies).

## 3.4 Module 3 — Consistency Check Bulk

### 3.4.1 Inputs

- Root folder with subfolders like "yyyymmdd\_hhmm\_step0" (optionally nested by market).

### 3.4.2 Process

1. Detects PRE/POST candidates by the most appropriate date/time.
2. Excludes folders using a blacklist ("ignore", "old", "bad", "partial", "incomplete", "discard", etc.).
3. Runs Module 2 for each detected market.

### 3.4.3 Outputs

- Same output structure as module 2, per market.
- Traceability file "FoldersCompared.txt".

## 3.5 Module 4 — Final Clean-Up

### 3.5.1 Inputs

- Final retune working folder.

### 3.5.2 Process

- Executes final cleanup policies (structure prepared to expand rules).

### 3.5.3 Outputs

- Versioned cleanup directory according to the active implementation.

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## 4 Configuration Audit module in detail

### 4.1 SummaryAudit checks philosophy

SummaryAudit sheet contains a high-level checks table by categories. The flow:

1. Excludes "UNSYNCHRONIZED" nodes based on "MeContext".
2. Evaluates NR, LTE, ENDC, Externals, TermPoints, cardinalities, and profiles.
3. Records each check as a row ("Category/SubCategory/Metric/Value/ExtraInfo").

### 4.2 Operational meaning of SummaryAudit rows

- **Category:** audited technical domain (NR/LTE/ENDC/MeContext/etc.).
- **SubCategory:** type of analysis (Audit/Inconsistencies/Profiles).
- **Metric:** specific rule evaluated.
- **Value:**
  - Integer: number of affected nodes/relations/cells.
  - "N/A": not evaluable due to missing columns.
  - Text: captured status or error.
  - **ExtraInfo:** list of nodes or bounded detail for troubleshooting.

### 4.3 SummaryAudit checks catalog

#### 4.3.1 MeContext Audit

- total unique nodes and unsynchronized node exclusion.
- "UNSYNCHRONIZED" nodes (excluded from the rest of the audits).

#### 4.3.2 NR Frequency Audit / NR Frequency Inconsistencies

**Source tables:** "NRCellIDU", "NRFrequency", "NRFreqRelation", "NRSectorCarrier", "NRCellRelation", "ExternalNRCellCU", "TermPointToGNodeB", "TermPointToGNB".

Main checks:

- Detection of NR nodes with N77 SSB (band 646600–660000).
- Classification of NR nodes as LowMidBand / mmWave / mixed.
- Nodes whose N77 SSBs are fully within allowed PRE or POST lists.

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- Nodes with N77 SSB outside allowed lists.
- Old/new SSB presence per node (only old, only new, both).
- Nodes with NRFreqRelationId in an unexpected format (auto-created outside convention).
- NR relations to old/new SSB.
- NR externals and termpoints pointing to old/new/unknown.

#### Typical triggering:

- Each check is enabled if the table and minimum required columns exist.
- If columns are missing, a "N/A" status row is added.
- If the table is empty or not found, an informative row "Table not found or empty" is added.

#### Interpretation:

- "Value > 0" in inconsistencies indicates a real deviation that requires investigation.
- "ExtraInfo" typically lists affected nodes for operational targeting.

### 4.3.3 LTE Frequency Audit / LTE Frequency Inconsistencies

**Source tables:** "GUtranSyncSignalFrequency", "GUtranFreqRelation", "GUtranCellRelation", "ExternalGUtranCell", "TermPointToENodeB".

#### Main checks:

- LTE nodes with old/new SSB.
- Nodes with both old/new or old without new.
- SSB outside the expected pre/post set.
- LTE relations to old/new and parameter discrepancies per cell relation.
- LTE externals OUT\_OF\_SERVICE for old/new.

### 4.3.4 ENDC Audit / ENDC Inconsistencies

**Source tables:** "EndcDistrProfile", "FreqPrioNR".

#### Main checks:

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- "gUtranFreqRef" and "mandatoryGUtranFreqRef" with old/new + N77B combinations.
- Nodes that do not contain the expected frequency combination.
- In "FreqPrioNR": old without new, both present, and parameter mismatch per cell.

#### 4.3.5 Cardinalities Audit / Inconsistencies

Cardinality checks per relation table (per node and/or per cell) to detect overprovisioning or gaps versus expected limits.

#### 4.3.6 Profiles Audit (if enabled)

- Compares PRE/POST profiles by supported profile MO.
- Detects parameter discrepancies between old/new variants.
- Adds results to SummaryAudit and auxiliary detail sheets.

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## 5 Consistency Check module in detail

### 5.1 Filtering by non-retuned nodes

If a POST SummaryAudit exists, the module obtains PRE/POST node lists and can exclude discrepancies whose target points to nodes that did not complete retune, reducing operational noise.

### 5.2 How it detects parameter discrepancies

1. Selects common PRE and POST relations by composite key:
  - GU: typically "NodeId", "EUTranCellFDDId", "GUtranCellRelationId".
  - NR: typically "NodeId", "NRCellCUId", "NRCellRelationId".
2. Excludes control columns (keys, frequency, Pre/Post, Date).
3. Compares value-by-value across shared columns.
4. Sets "ParamDiff=True" if at least one column differs.
5. In GU it ignores "timeOfCreation" and "mobilityStatusNR" to avoid false positives.

### 5.3 How it detects frequency discrepancies

1. Extracts base frequency from relation references ("extract\_gu\_freq\_base" / "extract\_nr\_freq\_base").
2. Discrepancy rule:
  - if PRE had "freq\_before" or "freq\_after", and POST does **not** end up in "freq\_after", it marks "FreqDiff=True".
3. Classifies the discrepancy as:
  - "FreqDiff\_SSBPost" (target identified as SSB-Post),
  - "FreqDiff\_Unknown" (cannot be associated to a known target).

### 5.4 How it detects neighbor discrepancies

They are split into three groups:

- **New relations:** keys present in POST and absent in PRE.
- **Missing relations:** keys present in PRE and absent in POST.
- **Discrepancies:** same key in PRE/POST but with parametric or frequency differences.

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## 5.5 Content of each ConsistencyChecks output sheet

- **Summary:** KPIs per table (PRE/POST volume, discrepancies, new/missing, source files).
- **SummaryAuditComparisson:** diff of SummaryAudit PRE vs POST metrics (without "ExtraInfo" to keep the comparison clean).
- **Summary\_CellRelation:** KPI per "Freq\_Pre/Freq\_Post" pair and per technology.
- **GU\_relations / NR\_relations:** relation universe enriched with target classification and command snippets.
- **GU\_param\_disc / NR\_param\_disc:** common relations with param differences.
- **GU\_freq\_disc / NR\_freq\_disc:** frequency discrepancies to SSB-Post targets.
- **GU\_freq\_disc\_unknown / NR\_freq\_disc\_unknown:** discrepancies with non-classifiable targets.
- **GU\_missing / NR\_missing:** relations removed versus PRE.
- **GU\_new / NR\_new:** relations added in POST.
- **GU\_all / NR\_all:** optional consolidated dump for extended analysis.

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## 6 Input requirements and operational best practices

- Keep market log exports in a consistent structure (especially for bulk).
- Validate that PRE/POST have the same table granularity and consistent naming.
- Validate frequency inputs ("n77\_ssb\_pre", "n77\_ssb\_post", "n77b\_ssb") before batch execution.
- Correctly configure allowed SSB/ARFCN lists to minimize false positives.
- Run **Configuration Audit** before Consistency Checks whenever possible.
- Use Bulk mode only with a controlled folder naming convention.
- Review "Summary" and "Summary\_CellRelation" first, then then deep-dive into detail sheets (ConfigurationAudit) and discrepancy tabs (ConsistencyCheck).
- Consume "Correction\_Cmd\_CA" and "Correction\_Cmd\_CC" as a remediation proposal, not as blind execution.

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## 7 Execution Modes and Versioning

- **GUI mode:** run without CLI arguments.
- **CLI mode:** run with explicit module and options.
- **Web Interface:** the tool can be run in a server/client infrastructure, accessing the server through a Web Interface where you can upload your inputs, enqueue different tasks and export the results when finish..

All Generated artifacts include a versioned suffix: "<timestamp>\_v<TOOL\_VERSION>".

This guarantees traceability and avoids collisions between runs.



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## 8 Known limitations and considerations

- The engine depends on log quality and structure: missing columns downgrade checks to "N/A".
- Some rules depend on naming conventions in references (NR/GU relation refs).
- The Final Clean-Up module is prepared to extend operation-specific policies.

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## 9 Quick module reference

Module	Main input	Main output	Goal
0 Update Network Frequencies	Logs folder	Persisted config	Update network frequency list
1 Configuration Audit	Logs/ZIP folder	Excel + PPT + CA commands	Audit configuration and profiles
2 Consistency Check	PRE and POST folders	2 Excel + CC commands	Compare pre/post relations
3 Consistency Check (Bulk)	Multi-market root folder	Module 2 outputs per market	Run bulk comparison
4 Final Clean-Up	Final folder	Clean-up folder	Operational final clean-up