

# 16. Coverage

## Coverage

`/admin/coverage` is an admin-only coverage explorer for enabled merged feeds.

It answers a practical question: where did this merged feed actually observe aircraft? It does not draw theoretical antenna range from receiver coordinates. The footprint is built from received aircraft positions.

### 1. What it shows

Coverage is calculated per enabled merged feed and includes:

1. live coverage for the current local day,
2. archived daily snapshots from the local coverage database,
3. a merged footprint polygon,
4. source feed activity for every source inside the merged feed,
5. basic intensity statistics such as active cells and observed cell-hours.

The page is useful for:

1. spotting holes in receiver coverage,
2. finding inactive or weak source feeds,
3. comparing coverage before and after feed changes,
4. validating whether a merged feed is receiving data from expected regions.

### 2. Live mode

Live mode reads the in-memory coverage collector and refreshes automatically.

Important details:

1. live coverage is for the current local date,
2. the UI refreshes the live snapshot every 15 seconds,
3. only aircraft with latitude and longitude contribute to coverage,
4. source activity is grouped by the direct feed that produced the position,

5. merged feed membership comes from the current configuration.

## 3. Archive mode

Archive mode reads persisted daily snapshots from `coverage.sqlite`.

Important details:

1. dates are listed per merged feed,
2. the archive uses the server's local timezone,
3. current state is flushed before archive reads so recent activity is not lost,
4. old data is retained for 365 days,
5. snapshots are still tied to the merged feed/source identities from configuration.

## 4. Protected merged feeds

Coverage follows merged feed access rules.

If a merged feed is password protected:

1. the coverage entry appears locked,
2. the admin must unlock it with the feed password,
3. if the merged feed depends on multiple protected source requirements, more than one password may be required,
4. archive date counts and snapshots are hidden until access is unlocked.

## 5. Metrics

Common fields:

1. `Sources` - number of source feeds in the merged feed,
2. `Active Sources` - sources that contributed at least one coverage cell for the selected day,
3. `Active Cells` - unique coverage cells observed by the merged feed,
4. `Peak Active Hours / Cell` - longest observed time in one cell,
5. `Total Cell Hours` - sum of observed cell time across all active cells,
6. `Footprint Polygons` - rendered coverage areas after simplification and gap fill.

Source rows show:

1. feed name,
2. receiver location if configured,

3. active cell count,
4. active hours,
5. last seen time.

## 6. Footprint logic

The raw collector stores positions in map cells and 15-minute time bins. The visible footprint is simplified to a coarser display grid and small linear gaps are closed before polygons are built.

This makes the map stable and readable while still preserving real coverage shape. Small gaps can be filled; large gaps remain visible.

## 7. Limitations

Coverage means observed traffic, not guaranteed radio range.

Empty or weak coverage can mean:

1. the receiver was down,
2. there was little traffic in that area,
3. positions arrived without latitude/longitude,
4. a source was not part of the selected merged feed,
5. the merged feed or source configuration changed during the day.

Receiver coordinates are displayed as source metadata when available, but they do not create coverage by themselves.

## 8. Troubleshooting

1. If no merged feeds are listed, create and enable a merged feed first.
2. If a merged feed is locked, unlock it with the feed password.
3. If there are no archive dates, wait for data to be collected and persisted.
4. If live coverage is empty, verify source feeds are connected and aircraft positions include latitude/longitude.
5. If a source has no receiver location, assign one in `/admin/locations`; this improves source context but does not change the observed footprint.

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