Data and Applications
Phase 3 Submission

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Team Number: 52

1. Relational Model (RM)

1.1 Notes

The relational model was created by directly mapping each entity, weak entity, and relationship from the ER diagram into relations with primary keys and foreign keys. No normalization changes were applied at this stage.

1.2 Relational Model Diagram

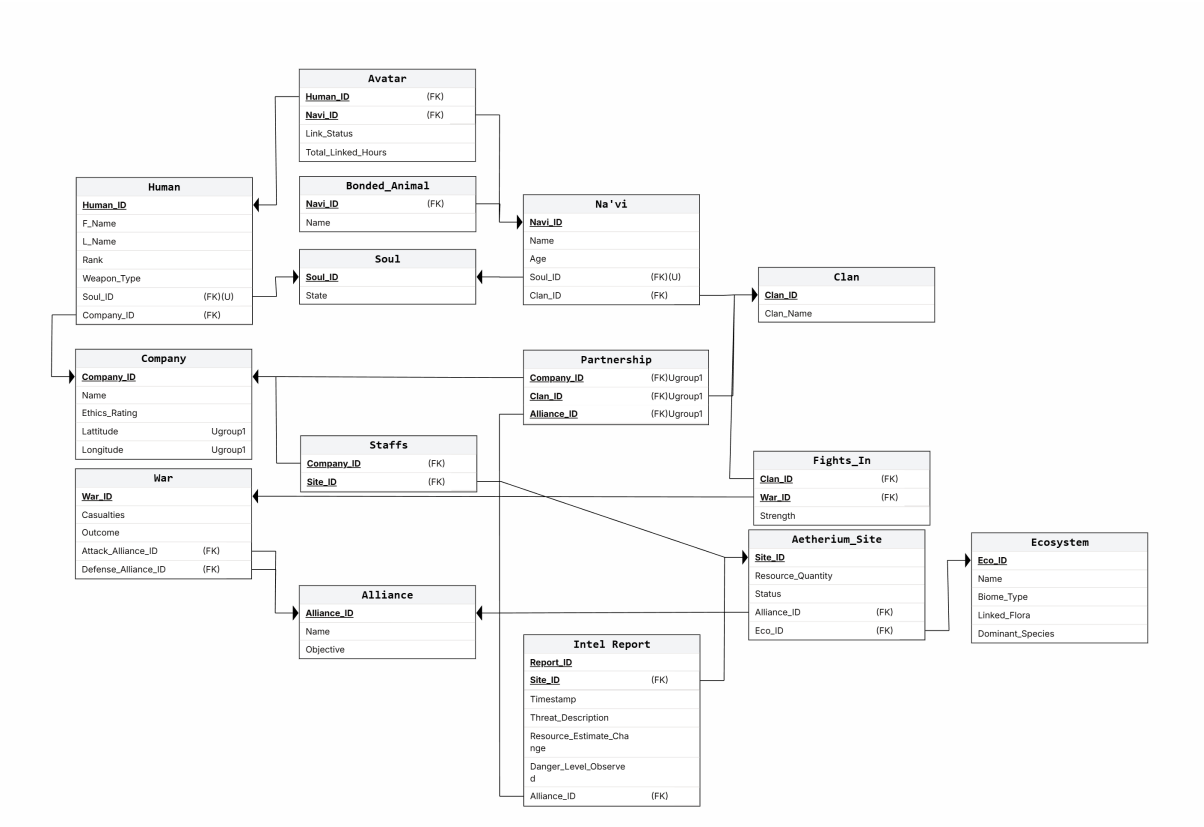

Figure 1: Relational Model derived from the ER diagram

2. First Normal Form (1NF)

2.1 Changes Applied

- The attribute `Linked_Flora` in `Ecosystem` was multivalued, so it was removed from that table.
- A new relation `Ecosystem_Flora(Eco_ID, Flora_Name)` was created to store each flora item separately.
- `Dominant_Species` was kept inside `Ecosystem` because the miniworld assumes only one dominant species.

2.2 1NF Diagram

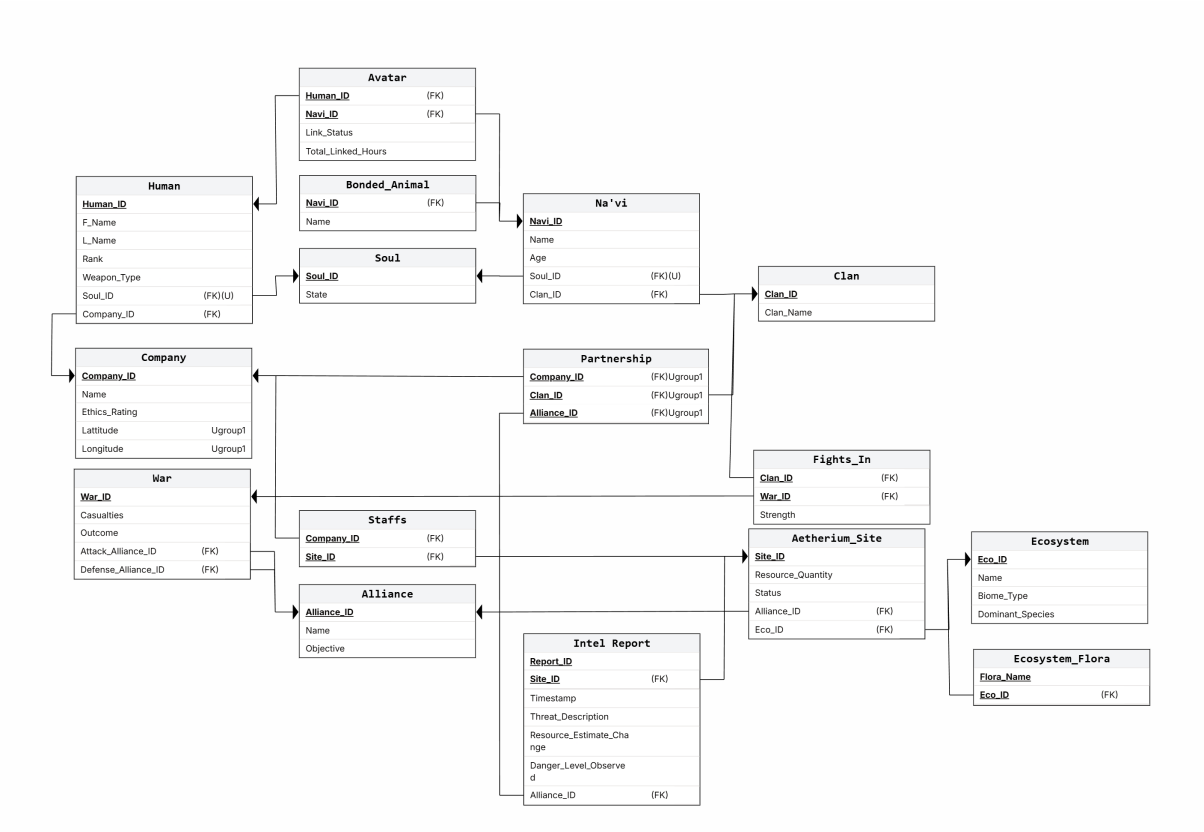

Figure 2: Relational Model after applying 1NF

3. Second Normal Form (2NF)

3.1 Changes Applied

- The weak relation `Intel_Report(Report_ID, Site_ID, ...)` contained several attributes that depended only on `Report_ID` and not on the full composite key.
- To fix this, `Intel_Report` was decomposed into:
  - `Report(Report_ID, ...)` — stores all report data.
  - `Report_Site(Report_ID, Site_ID)` — stores which site the report was made for.
- This removed the dependency on part of the composite key.

3.2 2NF Diagram

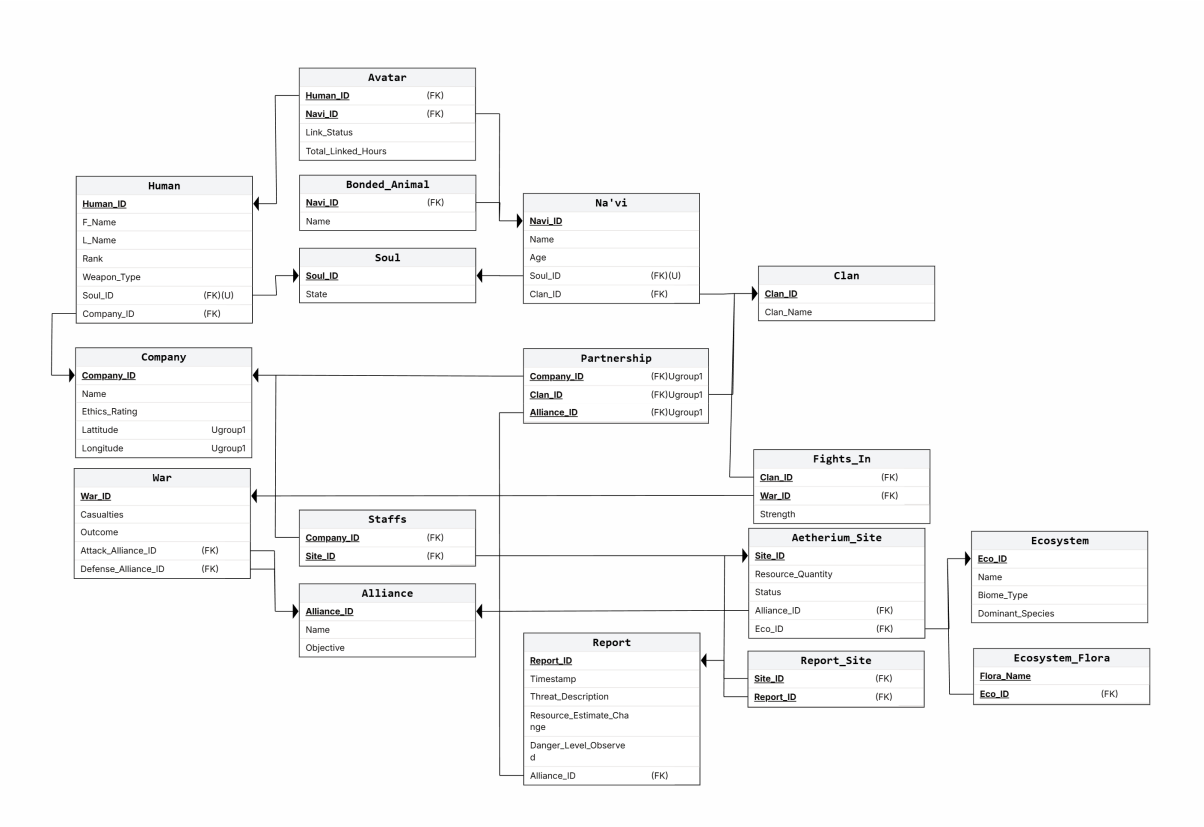

Figure 3: Relational Model after applying 2NF

4. Third Normal Form (3NF)

4.1 Changes Applied

- The `Report` table (created during 2NF) still grouped together metadata (such as timestamp and author) with report observations (threat description, resource change, danger level).
- To separate these two logical groups and avoid update issues, `Report` was split into:
  - `Report_Meta(Report_ID, Human_ID, Timestamp)`
  - `Report_Observation(Report_ID, Threat_Description, Resource_Estimate_Change, Danger_Level_Observed, Alliance_ID)`
- Both resulting tables now contain attributes that depend directly on their primary keys only.

4.2 3NF Diagram

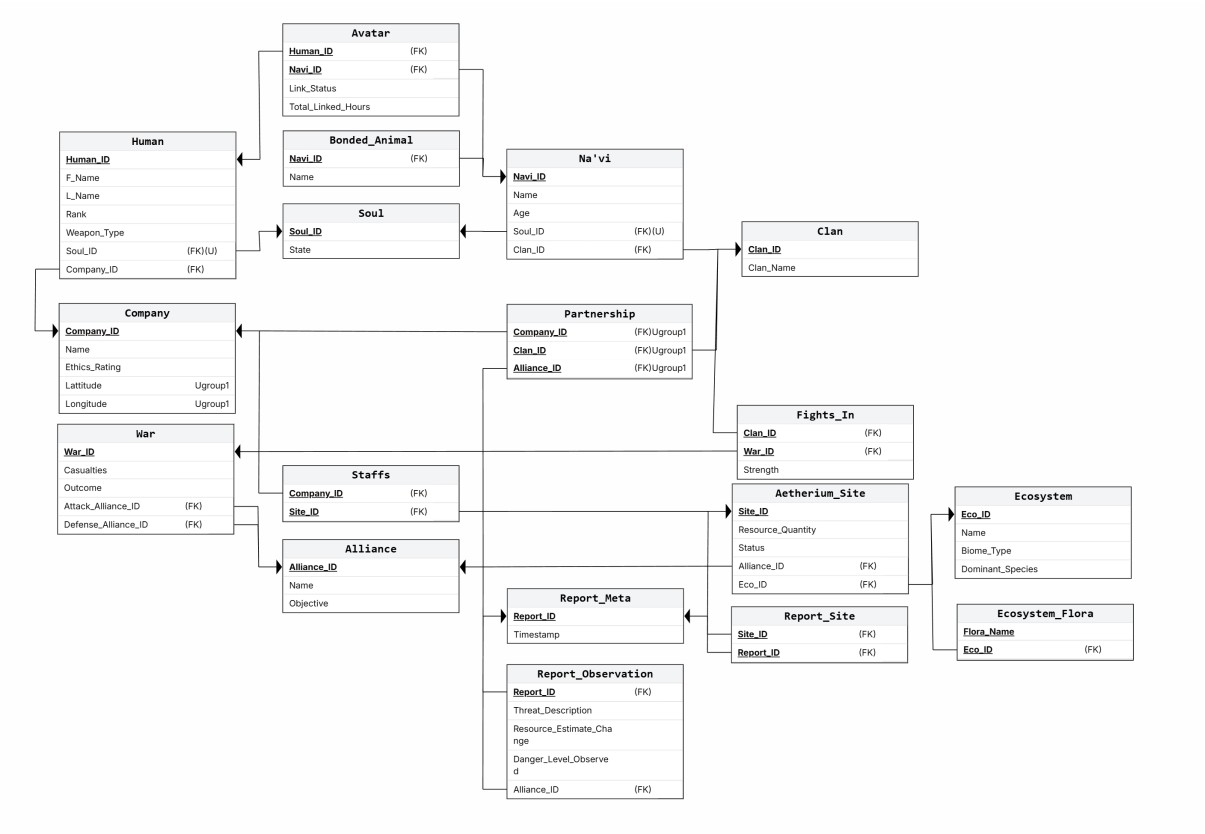

Figure 4: Relational Model after applying 3NF

5. Summary of Changes

- **1NF:** Removed the multivalued attribute `Linked_Flora` and created the table `Ecosystem_Flora`.
- **2NF:** Split `Intel_Report(Report_ID, Site_ID, ...)` into `Report` and `Report_Site` because the non-key attributes depended only on `Report_ID`.
- **3NF:** Split `Report` into `Report_Meta` and `Report_Observation` to separate metadata and observation fields.