

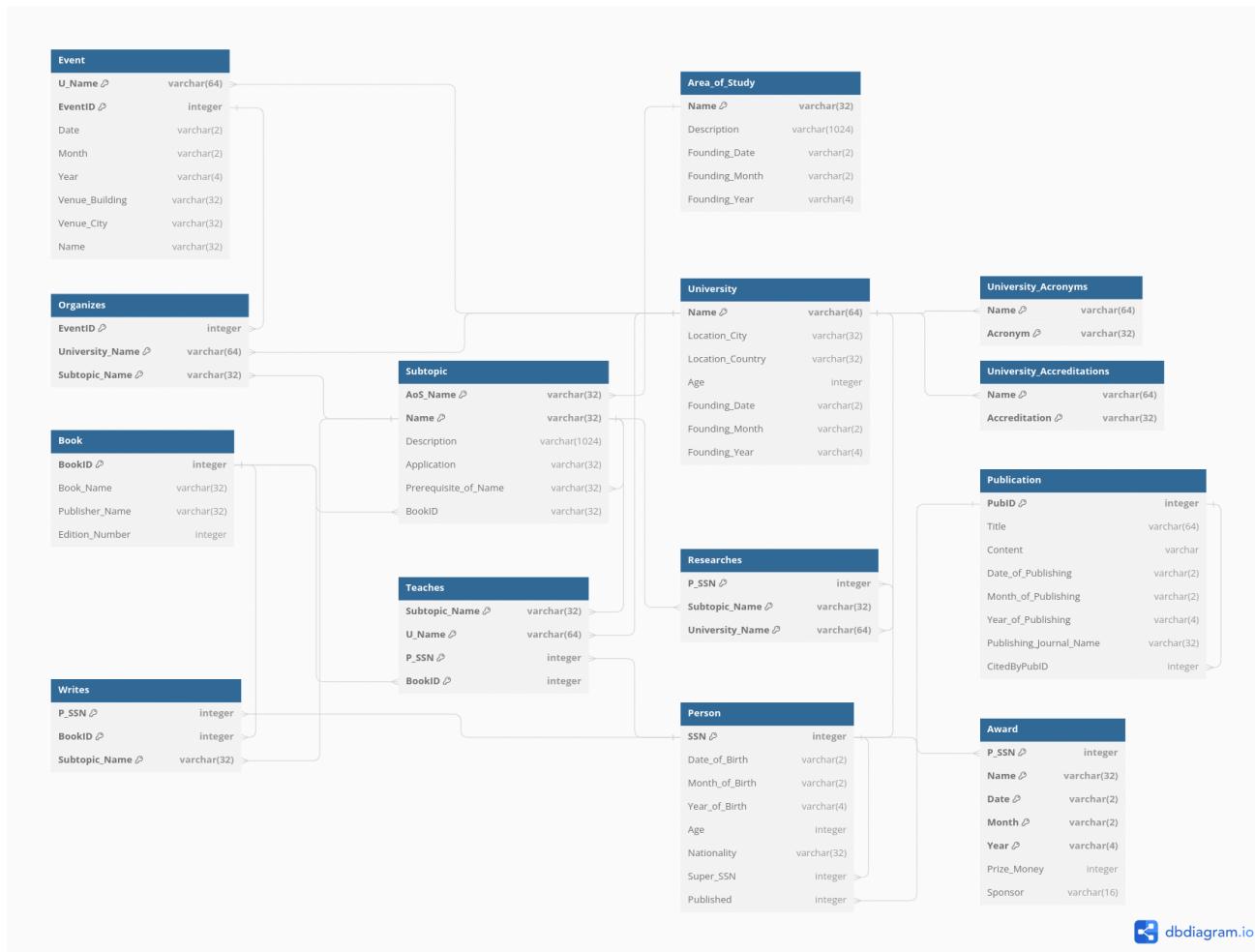
Data And Applications Project Phase 3

Team Name: long long int

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1. Relational Model



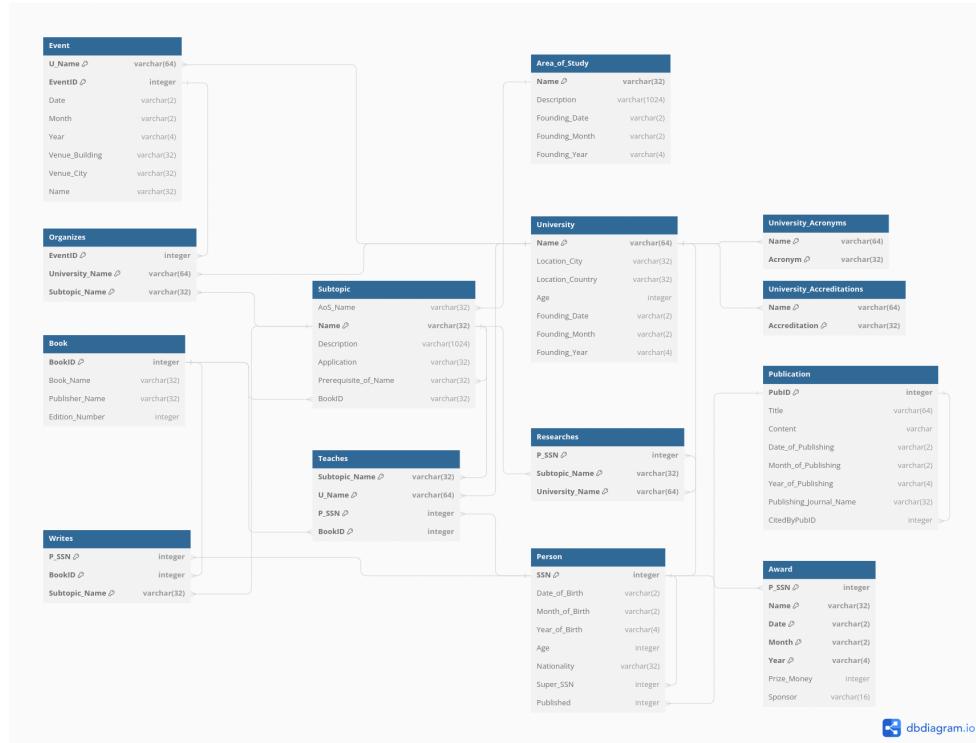
- Split all the composite attributes into their components with appropriate sizes.
 - All dates into date, month and year
 - Location into Location_City and Location_Country

- Venue into Venue_Building and Venue_City
- Moved multivalued attributes into new relations and referenced the original relation using foreign key.
 - University_Acronyms
 - University_Accreditations
- Added BookID primary key for Book instead of composite key for ease of referencing as foreign key.
- Added EventID as partial primary key for Event instead of the previous composite partial primary key.
- Added an attribute in the same relation for recursive relationships.
 - PREREQUISITE
 - SUPERVISES
 - CITES
- Added foreign keys in appropriate relations for N:1 and 1:N relationships.
- Added new relations for the rest of the relationships with entity types referenced by foreign keys

2. Conversion to 1NF

Converting an ER diagram to a relational model already ensures that there are no composite and multi-valued attributes. Thus, the relational model is in 1NF.

3. Conversion to 2NF



- In the **Subtopic** relation, the non-key attributes depend only on **Name**, which is a subset of the primary key **{AoS_Name, Name}**. This violates the 2NF condition that every non-key attribute must be fully functionally dependent on the primary key. To conform to this condition, we can drop **AoS_Name** as a primary key and make it a non-key attribute.

4. Conversion to 3NF

- In the **University** relation, **Age** depends on **{Founding_Date, Founding_Month, Founding_Year}**, while **{Founding_Date, Founding_Month, Founding_Year}** depend on **Name**. Thus, **Age** transitively depends on **Name**, which violates the 3NF condition that no transitive partial dependency should exist. To conform to this condition, we remove the **Age** attribute entirely. This also has the side effect of not having to update **Age** based on the current date, as it can be calculated at the time of querying.
- In the **University** relation, **Location_Country** depends on **Location_City**, while **Location_City** depends on **Name**. Thus, **Location_Country** transitively depends on **Name**, which violates the 3NF condition that no transitive partial dependency should exist. To conform to this condition, we create a new table **Location** with primary key **Location_City**, and reference it as a foreign key in the **University** relation.

