Phase II. Logical Modeling

Jordan Doughty
jdoughty@patriots.uttyler.edu

Trisha Pradhan
Tpradhan@patriots.uttyler.edu

Merisha Subedi
Msubedi@patriots.uttyler.edu

Felica Ortega
fwhitaker2@patriots.uttyler.edu

Jason O'Brien
Jobrien6@patriots.uttyler.edu

Ben Tabi Atem Ako
Btabiatemako@patriots.uttyler.edu

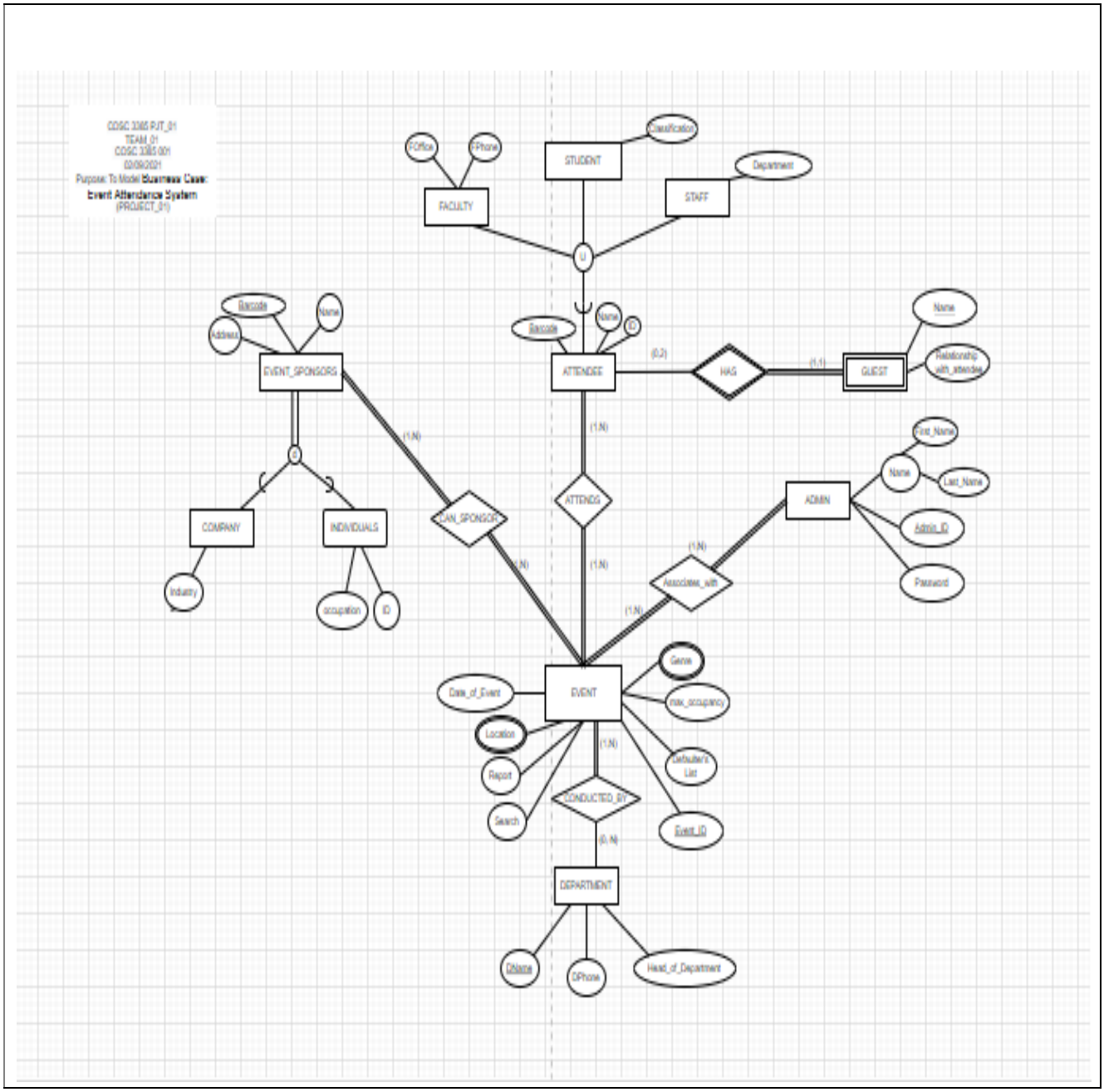
0. Pre-Illumination

In this report we will describe the logical modeling of the Attendance database. To do this we will break it into three sections. In Section 1 we modify the original EER diagram and explain what has changed, with respect to our Phase I EER diagram. In Section 2 we map the revised EER diagram into relational schemas using appropriate mapping algorithms. Section 3 is the normalization of these relational schemas into third-normal forms. Finally, we summarize the report and its data.

1. Modified EER diagram

The modified EER diagram is shown in Figure 1.

Figure 1. Modified EER diagram



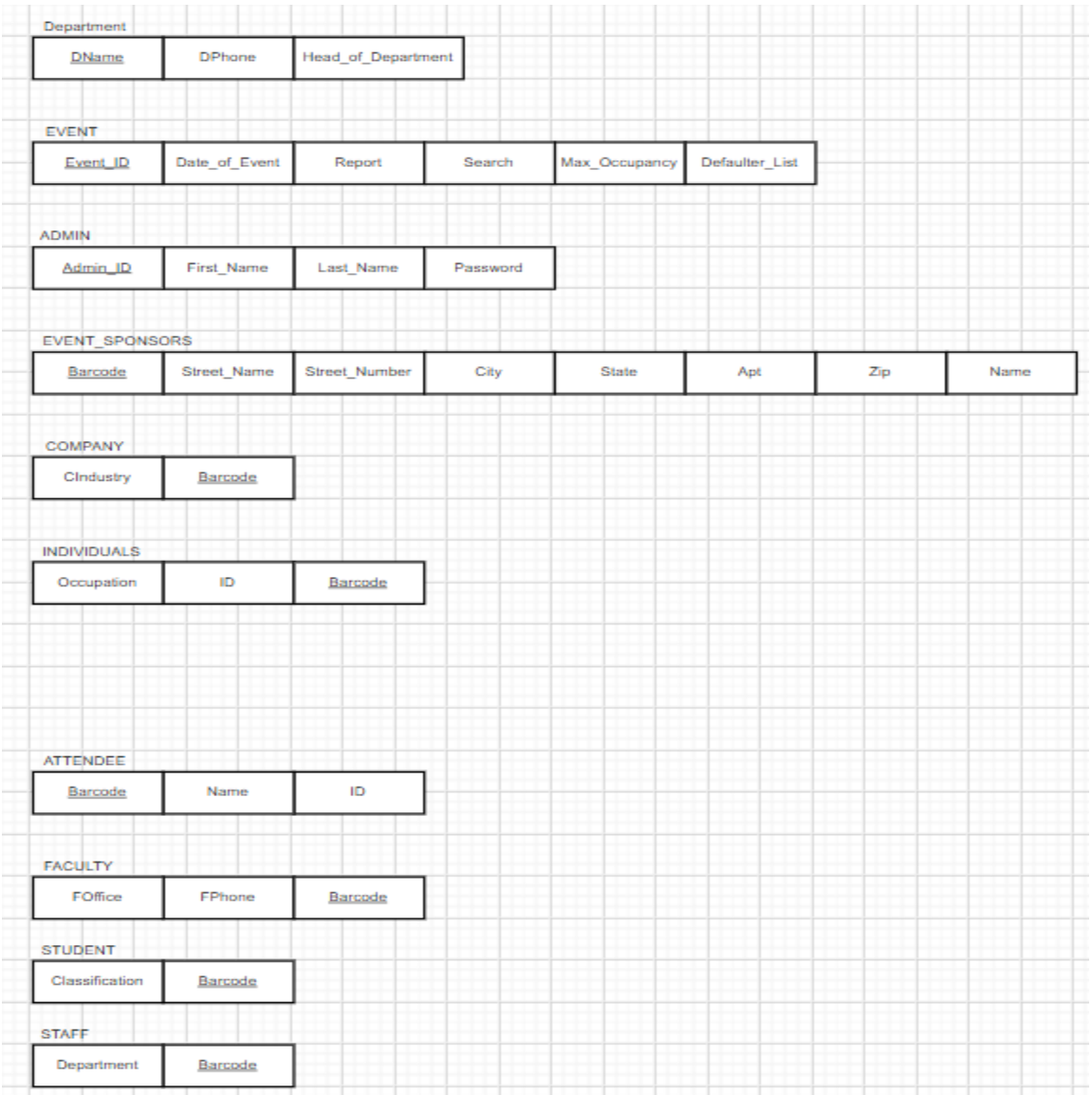
2. Mapping Relational Schemas

We convert the EER model to a relational model using the following steps.

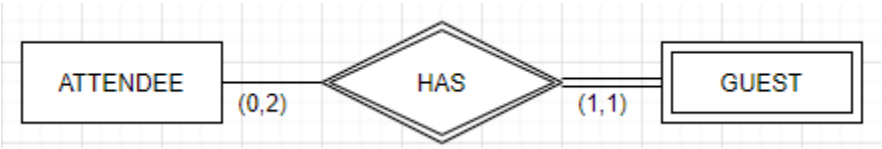
2.1 Mapping of Regular Entity Types, Specializations.

We convert the EER model to a relational model using the following steps.
For each entity type E, we will create a relation R that will include all the simple attributes of E. We will choose one of the key attributes as a primary key for R.

Figure 2: Relation Table Step 1



2.2 Mapping of Weak Entity Types



GUEST (Name, Relationship_with_attendee, Attendee_Barcode)

We have one weak entity type Guest. Weak entity type Guest is represented as a separate relation in the schema and has an identifying relationship with Attendee. The relation Guest includes the attributes such as Name and Relationship_with_attendee. It also includes foreign key Guest.Attendee_Barcode that references the primary key Attendee.Barcode.

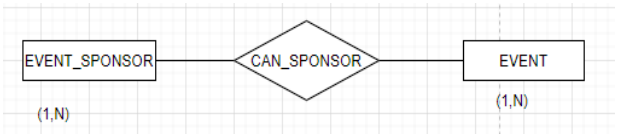
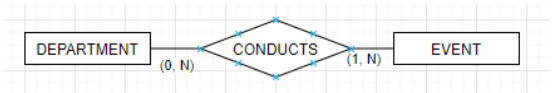
2.3 Mapping of Binary 1:1 Relationship Types

Our database does not contain any 1:1 binary relationship type.

2.4 Mapping of Binary 1:N Relationship Types

The only 1:N relationship in our database is with Guest weak entity type which has already been mapped in 2.2.

2.5 Mapping of Binary M:N Relationship Types

Relation	Mapping Method
	(2.5)We create associates_with relation. We include the foreign key Associates_with.Admin_Id that references primary key Admin.Admin_Id and foreign key Associates_with.Event_Id that references primary key Event.Event_Id.
	We create can_sponsor relation. We include the foreign key can_sponsor.Barcode that references primary key Event.Barcode and foreign key can_sponsor.Event_Id that references primary key Event.Event_Id.
	We create Attends relations. We include the foreign key attends.Barcode that references primary key Attendee.Barcode and foreign key Attends.Event_Id that references primary key Event.Event_Id.
	We create conducted_by relations. We include the foreign key conducts_by.DName that references primary key Department.DName and foreign key Conducted_by.Event_Id that references primary key

	Event.Event_Id.

2.6 Mapping of Multi-valued Attributes

Location(Event_location, Event_ID)
Genre(Event_Genre, Event_ID)
For both Multivalued attributes Location and Genre, we created a new relation. For Location relation, we include foreign key Location.Event_ID which will reference the primary key Event.Event_ID.
For Genre, we included foreign key Genre.Event_ID which will reference the primary key Event.Event_ID.

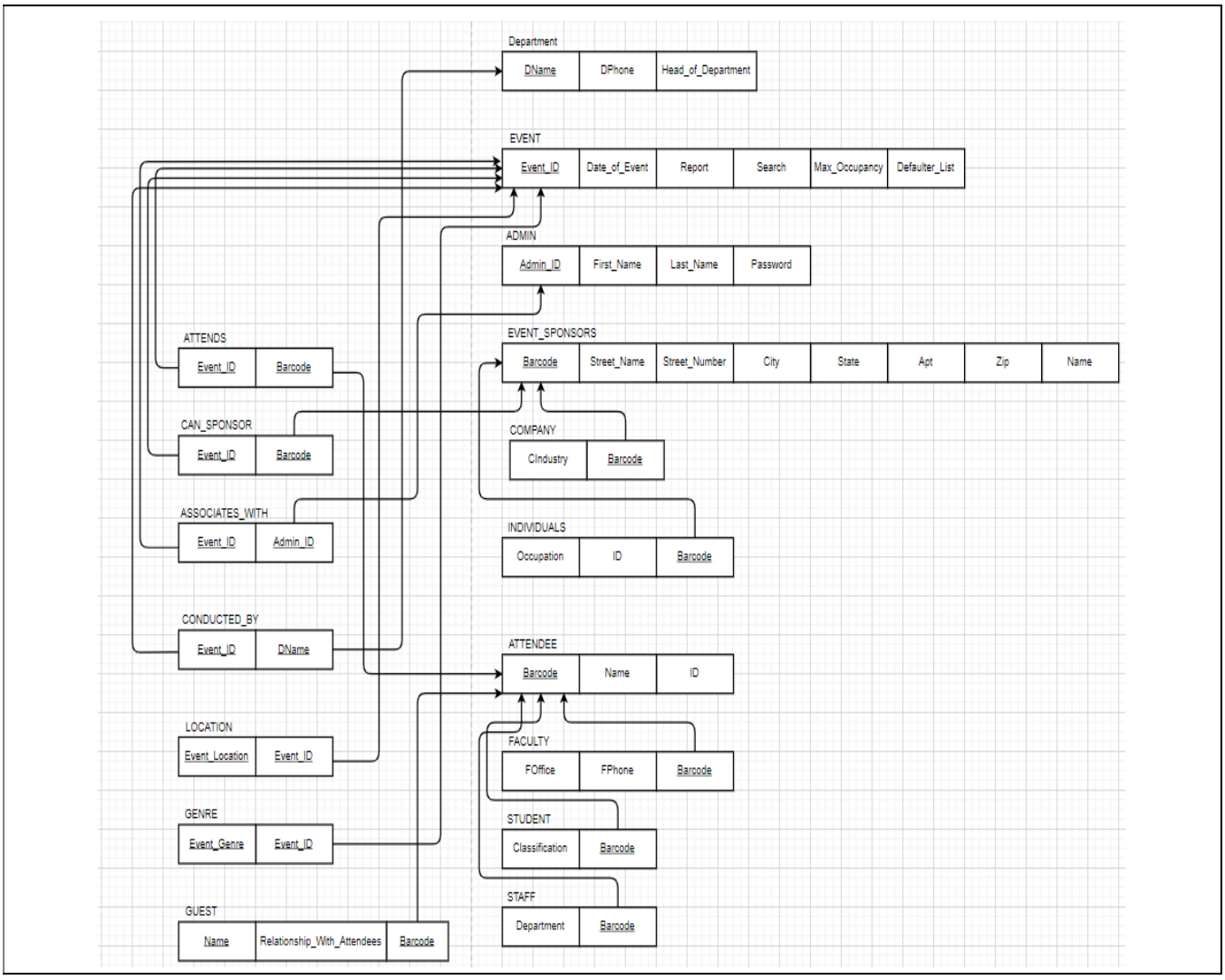
2.7 Mapping of N-ary Relationship Types

We do not have a N-ary relationship in our database.

2.8 Final Relation Schema

After the above steps, we get the result of relation schemas. We use arrows to show the direction of the foreign keys pointing towards the primary keys of the referenced relations. Figure 2.2 displays the relational schemas converted from the EER diagram in Phase I.

Figure 2.2. the relational model of Attendance system (complete)



3. Normalization

1. DEPARTMENT(Dname, DPhone, Head_of_Department)

Dname	**Dphone**	**Head_of_Department**
Computer Science	111-111-1111	Spongebob Squarepants
Nursing	445-634-2312	Hillary Clinton
Business	333-333-3333	Santa Claus
Engineering	777-777-7777	Thanos
Pharmacy	676-990-3001	Captain Caveman

KEY - Dname

FD1 - Dname → Dphone, Head_of_Department

3NF – The relation is in 2NF and no transitive dependencies exist, hence the relation is in 3NF.

2. EVENT(Event_ID, Date_of_Event, Max_Occupancy)

Event_ID	**Date_of_Event**	**Max_Occupancy**
1111	10/25/1985	100
2222	12/11/1986	420
3333	05/19/1987	100
4444	08/26/1988	62
5555	01/20/1989	3

KEY - Event_ID

FD1 - Event_ID → Date_of_Event, Max_Occupancy

3NF - Yes, relation is in 2NF and no transitive dependencies exist.

3. ADMIN (Admin_ID , First_Name, Last_Name, Password)

Admin_ID	**First_Name**	**Last_Name**	**Password**
101	Michael	Scott	MScott124
202	Dwight	Schrute	Dwight@123
303	Pamela	Beesly	P@mmyBee10
404	Colonel	Sanders	CS@kfc
505	Tony	Tiger	FF@ceral

KEY - Admin_Id

FD1- Admin_ID → First_Name, Last_Name, Password

3NF : The relation is in 3NF since no transitive dependencies and partial dependencies exist.

4. EVENT_SPONSORS (Barcode, Street_Name, Street_Number, City, State, Apt, Zip, Name)

Barcode	**Street_Name**	**Street_Number**	**City**	**State**	**Apt**	**Zip**	**Name**
557480	University Blvd.	3900	Tyler	Texas	1130	75701	University of Texas at Tyler
125589	S Whaley	300	Tupelo	Mississippi	2330	53884	Longview Fire Department #55
458779	N. Dream St.	2200	Orlando	Florida	1222	69756	Weston Bank Server
875641	Preston Rd	2601	Dothan	Alabama	3221	87759	Microsoft Stores
390024	Old Omen Rd	3088	Cleveland	Ohio	4112	44331	Nil Sporting Goods
937456	McDonald Rd	3700	Knoxville	Tennessee	3311	77905	Helena Scott
334689	My Rd	123	Monroe	Louisiana	1332	55829	Belami Jones
267252	High Dr	348	Eureka	California	1030	14998	Marc Garcia
026352	Alumni Dr.	360	Las Vegas	Nevada	2005	95666	James Nguyen

Key: Barcode

FD1: Barcode → Street_Name, Street_Number, Apt, Zip, Name

FD2 : Zip → City, State,.

3NF: Since Zip is a non-key attribute and can determine other non-key attributes, the relation has transitive dependencies and hence is not in 3NF. (Split the tables into two)

Event_Sponsors 3NF**:**

Sponsors_Barcode (Barcode, Street_Name, Street_Number, Apt, Zip, Name)

Barcode	**Street_Name**	**Street_Number**	**Apt**	**Zip**	**Name**
557480	University Blvd.	3900	1130	75701	University of Texas at Tyler
125589	S Whaley	300	2330	53884	Longview Fire Department #55
458779	N. Dream St.	2200	1222	69756	Weston Bank Server
875641	Preston Rd	2601	3221	87759	Microsoft Stores
390024	Old Omen Rd	3088	4112	44331	Nil Sporting Goods
937456	McDonald Rd	3700	3311	77905	Helena Scott
334689	My Rd	123	1332	55829	Belami Jones
267252	High Dr	348	1030	14998	Marc Garcia
026352	Alumni Dr.	360	2005	95666	James Nguyen

Key: Barcode

FD1: Barcode → Stree_Name, Street_Number, Apt, Zip, Name

3NF: Since the relation does not have any partial and transitive dependencies, it is in 3NF.

Sponsors_Zip(Zip, City, State)

Zip	**City**	**State**
75701	Tyler	Texas
53884	Tupelo	Mississippi
69756	Orlando	Florida
87759	Dothan	Alabama
44331	Cleveland	Ohio
77905	Knoxville	Tennessee
55829	Monroe	Louisiana
14998	Eureka	California
95666	Las Vegas	Nevada

Key: Zip

FD1: Zip → City, State

3NF: Since the relation does not have any partial and transitive dependencies, it is in 3NF.

5. COMPANY(<u>Barcode,</u> CIndustry)

<u>Barcode</u>	**CIndustry**
125589	Safety
458779	Finance
390024	Sports
557480	Education
875641	Technology

KEY - Barcode

FD1- Barcode → CIndustry

3NF - Relation is in 3NF with no transitive dependencies**.**

6. INDIVIDUALS(Occupation, ID, <u>Barcode</u>)

Occupation	**ID**	**<u>Barcode</u>**
Doctor	356	937456
Teacher	673	334689
Software Developer	560	267252
Fire Fighter	325	026352

KEY - Barcode

FD1-Barcode → ID, Occupation

3NF - The relation is not in 3NF since ID can determine the occupation of the individual. Hence, there exists a transitive dependency.

Transitive dependency: ID → Occupation (Separate into two relations)

INDIVIDUALS (Barcode, ID)

ID	**Barcode**
356	937456
673	334689
560	267252
325	026352

Key: Barcode
FD1: Barcode → ID
3NF: The relation is in 3NF since no transitive and partial dependencies exist.

INDIVIDUAL_OCCUPATION (ID, Occupation)

Occupation	**ID**
Doctor	356
Teacher	673
Software Developer	560
Fire Fighter	325

Key: ID

FD1: ID → Occupation

3NF: The relation is in 3NF since there are no partial and transitive dependencies.

7. ATTENDEE(Barcode, Name, ID)

Barcode	**Name**	**ID**
131516	Rachel Green	505
233568	Monica Geller	606
333555	Janice Hosenstein	707
343536	Chandler Bing	808
222543	Gunther Blah	909
912101	Mike Hannigan	1010
338235	Carol Denvers	101
387662	Tony Stark	202
110394	Steve Rogers	303

KEY -Barcode

FD1- Barcode → Name, ID

2NF - Yes, there are no partial dependencies

3NF - Since ID can determine the Name of the attendee, hence we have a transitive dependency.

Transitive Dependency - ID → Name (Separate it into two relations)

Attendee 3NF:

Attendee_ID (<u>Barcode</u>, ID)

<u>Barcode</u>	**ID**
131516	505
233568	606
333555	707
343536	808
222543	909
912101	1010
338235	101
387662	202
110394	303

Key: Barcode
FD1: Barcode → ID
3NF: The relation is in 3NF.

Attendee_Name (<u>ID</u>, Name)

<u>ID</u>	**Name**
505	Rachel Green
606	Monica Geller

707	Janice Hosenstein
808	Chandler Bing
909	Gunther
1010	Mike Hannigan
101	Carol Denvers
202	Tony Stark
303	Steve Rogers

Key: ID

FD1: ID→ Name

3NF: The relation is in 3NF.

8. FACULTY(FOffice, FPhone, Barcode)

FOffice	**FPhone**	**Barcode**
COSC143	234-322-6589	131516
ENG332	456-207-1990	233568
HIS493	662-456-2241	333555

KEY - Barcode

FD1- Barcode → FOffice, FPhone

3NF - The relation is in 3NF because there are no transitive dependencies.

9. STUDENT(Classification, Barcode)

Classification	**Barcode**
Senior	343536
Junior	222543
Sophomore	912101

KEY -Barcode

FD1- Barcode → Classification

3NF - The relation is in 3NF since there are no transitive dependencies

10. STAFF(Department, Barcode)

Department	**Barcode**
History	912101
English	338235
Art	387662
Computer Science	110394

KEY - Barcode

FD1- Barcode → Department

3NF - The relation is in 3NF since there are no transitive dependencies.

11. ATTENDS(Event_Id, Barcode)

Event_ID	**Barcode**
1111	131516
2222	233568
3333	333555
4444	343536
5555	222543

KEY -Barcode, Event_ID

3NF: There are no functional dependencies in this relation, hence it is in 3NF.

12. CAN_SPONSOR(Event_ID, Barcode)

Event_ID	**Barcode**
1111	557480
2222	125589
3333	458779
4444	875641
5555	390024

KEY - Event_ID, Barcode

FD1- No functional Dependencies

3NF: The relation is in 3NF since there are no functional dependencies**.**

13. ASSOCIATES_WITH(Event_ID, Barcode)

Event_ID	**Admin_ID**
1111	101
2222	202
3333	303
4444	404
5555	505

KEY -Event_ID, Admin_ID

FD1- No functional dependencies.

3NF - The relation is in 3NF since there are no functional dependencies.

14. CONDUCTED_BY(Event_ID, D_Name)

Event_ID	**D_Name**
1111	Computer Science
2222	Nursing
3333	Business
4444	Engineering

5555	Pharmacy

KEY - Event_ID, D_Name

FD1- No functional dependencies

3NF - The relation is in 3NF since there are no functional dependencies**.**

15. LOCATION (Event_Location, Event_Id)

Event_Location	**Event_ID**
Cafeteria	1111
Stadium	2222
Classroom	4444
Theater Hall	3333

KEY - Event_Location, Event_ID

FD1- No functional dependencies

3NF - The relation is in 3NF since there are no functional dependencies**.**

16. GENRE(Event_Genre, Event_ID)

Event_Genre	**Event_ID**
Intercollege Basketball Event	2222
SAP Training	4444

Homecoming Movie Night	3333
MidNight Breakfast	1111

KEY - Event_ID, Event_Genre

FD1- No functional dependencies

3NF- The relation is in 3NF with no functional dependencies**.**

17. GUEST(Name, Relationship_With_Attendees, Barcode)

Guest_Name	**Relationship_with_attende e**	**Attendee_Barcod e**
Ross Geller	Brother	606
Phoebe Buffay	Friend	606
Joey Tribbiani	Friend	707

KEY - Attendee_Barcode, Guest_Name

FD1- Attendee_Barcode, Guest_Name→ Relationship_with_attendee

3NF- There is no transitive dependency since both primary keys together determine non key attributes, hence the relation is in 3NF.

4. Conclusion

In this report we discussed and drew out the relational schemas for our Attendance database system. We also explain our assumptions in the documentation, and models. This report analyzes the logical model of the Attendance database using relational mapping and normalization. The next steps

are to implement the database. In the future, we may make some changes to the design when facing practical difficulties and client requests.