COMP 1630
PROJECT 1 - ALUMNI DATABASE DESIGN

Shawn Eapen
Kima Janvelyan
Jae Sung Kim
Cassius Fernandes

TABLE OF CONTENTS

Introduction

In the Database Design/SQL class, our class was assigned a project to design the Cambridge University Alumni database. A narrative was presented, out of which we had to derive business rules, constraints, attributes, and design accordingly. We (group B) worked together at every stage, reaching mutual solutions and conclusions.

Process description

First, we identified the business rules and constraints that stemmed directly from the narrative. Then, we asked questions to the professor, from which we derived additional business rules and constraints. We held several group meetings to streamline our conclusions. Afterwards, we identified all the entity relationships, highlighted the M:N relationships and resolved, modelled the Crow's diagram step-by-step, and normalized to 3NF. Finally, as instructed, we utilized sample data to give examples of reports.

Assumptions

Throughout the assignment, we made an assumption that invoicing options will not play a role in the database design process (which usually does in real life situations).

Limitations

Since we haven't had exposure to SQL yet, we took a theoretic approach to design. Once we achieve a better understanding of how SQL works, processes may be improved.

Conclusion/Observations

We understand that in the real world there can be many more attributes involved for this type of database. But for simplicity sake we only created what is necessary to establish relations amongst entities, plus a few filler attributes to be able to draw a decent picture. We also assigned surrogate keys to replace composite primary keys. For the normalization process we left the primary keys as they were, then we put the surrogate keys in place because establishing a relation between a bridge and another entity (where this time the bridge is the parent) became too cumbersome with the existing primary key.

Body of Work

1. ***A) The formal business rules:***
    - One member may be in one or more interest/activity clubs
    - One interest/activity club may have zero or more members
    - One member may have zero or more interests
    - One interest may be held by one or more members
    - One event may host zero or more members
    - One member may attend zero or more events
    - There are 3 states that a member can be in: Active, Holding and Former
    - Unpaid members get a grace period of up to 1 year and convert to Holding status
    - Historic list contains Former (expired/unpaid beyond grace period) memberships
    - Records move from Active to Historic entity entirely
    - Invitations can be 3 types: a) General alumni club paid members, b) Gen + 1 other club (has to be paid in both), and c) Gen + more than 1 other club (has to be a paid member in all)
    - One member may receive zero or more invitations
    - One invitation belongs to one person only, who may or may not attend

B) Constraints

- Only paid members can attend events
- All graduates become enrolled in the General Alumni Club
- The first year of the General Alumni Club is free of charge
- After the first year expires, a member has to pay the General Alumni Club fee to be able to join any other clubs
- After the first year expires, a member has to pay the General Alumni Club fee to be able to join any other clubs
- Annual fees must be paid to be a member of a club
- Allow for overlap between General Alumni Club fee due date and Activity/Interest membership expiry date
- Fees are for period of 1 year
- Have to be able to search by Club membership, Interest, Post Code, Country, Graduation Year and Subject studied

C) Mandatory attributes

- Primary key for each entity
- First names
- Last names
- Postcodes
- Countries
- Graduation years
- Subject Studied

- Club names
- Interest names
- Membership status
- Start and end dates of current membership
- Start and end dates of previous memberships
- Fee status for memberships
- Fee status for events
- Event names
- Event dates
- Event prices

2. *Identify all M: N relationships and resolve to 1: M relationships (do not go directly to 1:M, if the original business rules implied a M:N, initially)*

The following relationships were identified as Many to Many:

Alumni to Clubs: M:N
Alumni to Interest: M:N
Alumni to Event: M:N
Clubs to Event: M:N

To resolve them, bridge entities were created for each.

For Alumni to Clubs, a Membership Records entity was created, in which composite PKs of Alumni_ID and Club_ID were identified.

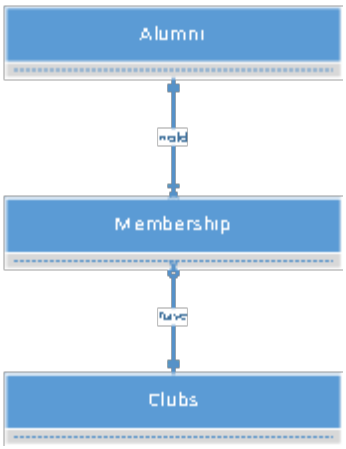
For Alumni to Interest, an Interest Records entity was created, in which composite PKs of Alumni_ID and Interest_Name were created.

For Alumni to Event, an Invitation entity was created, in which composite PKs of Alumni_ID and Event_ID were created.

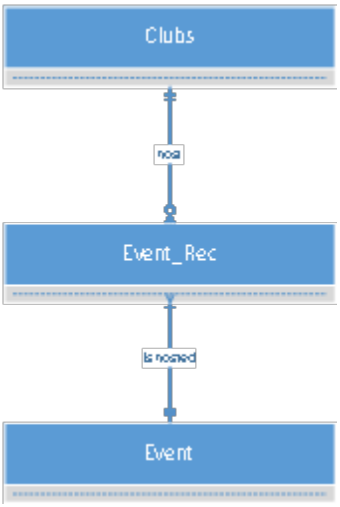
For Clubs to Event, an Event Records entity was created, in which composite PKs of Alumni_ID and Event_ID were created.

3. *Structure your modelling in stages – deal with each functional area separately as an External or End User view (for instance Members and Club Memberships should be treated as such a segment), before bringing them all together in the Conceptual or Designer's view.*

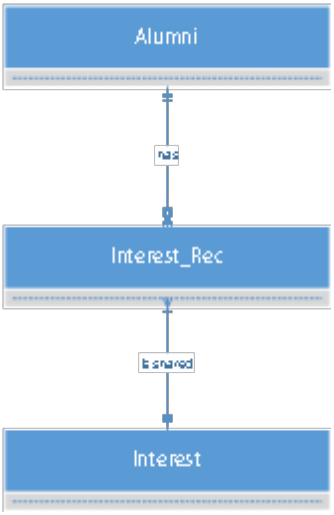
Alumni to Clubs



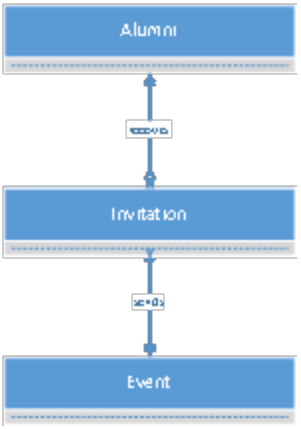
Clubs to Event



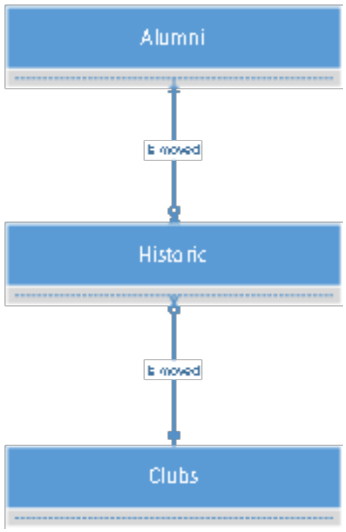
Alumni to Interest



Alumni to Event



Membership to Historic



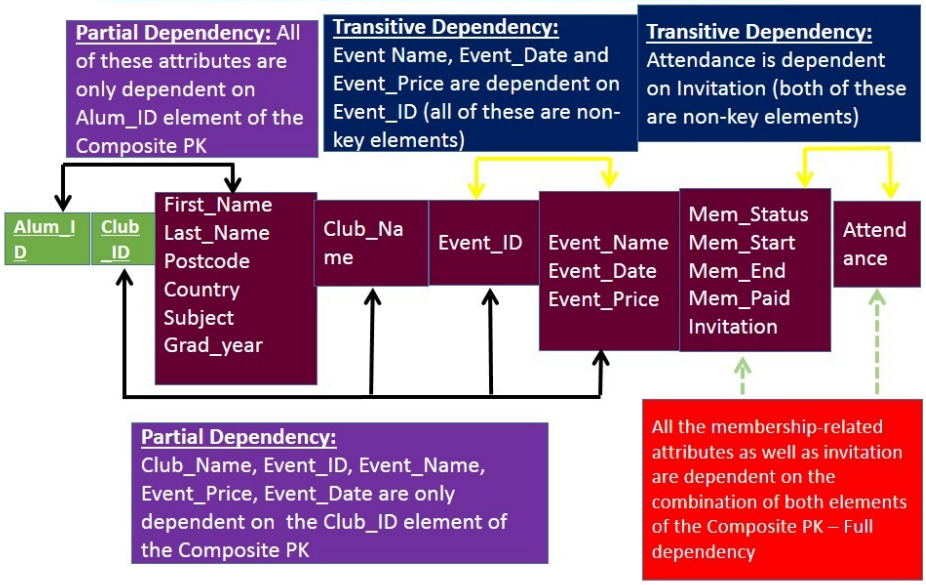
4. *Normalization*

1NF *(**Alum_ID, Club_ID**, First_Name, Last_name, Postcode, Country, Subject, Grad_Year, Club_Name, Event_ID, Event_Name, Event_Price, Event_Date, Invitation, Mem_Status, Mem_Start, Mem_End, Mem_Paid, Attendance)*
Partial Dependencies:
Alum_ID -> First_Name, Last_Name, Postcode, Country, Subject, Grad_Year
Club_ID -> Club_Name, Event_Name, Event_Price , Event_Date
Transitive Dependency:
Event_ID -> Event Name, Event_Price, Event_Date
Invitation -> Attendance

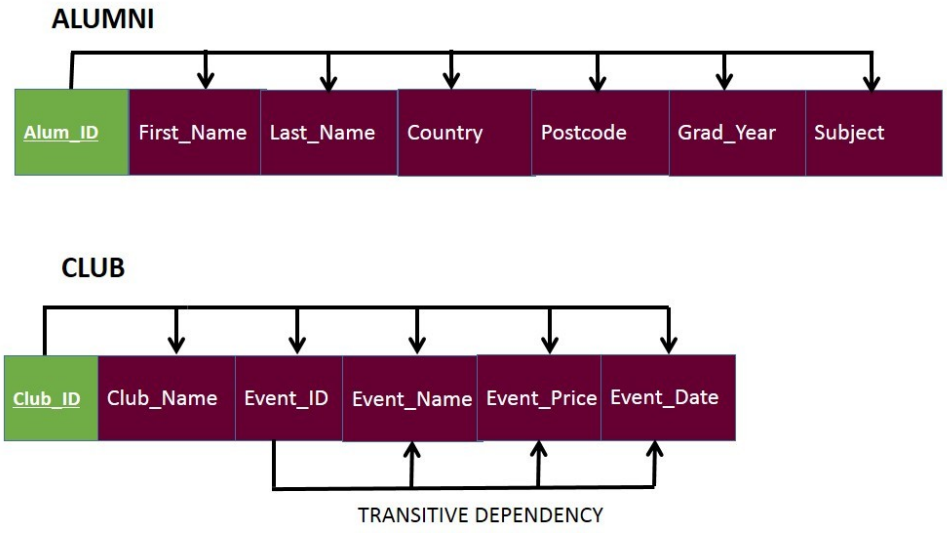
2NF*:*
Alumni (Alum_ID, *First_Name, Last_name, Postcode, Country, Subject, Grad_Year)*
Club (Club_ID*, Club_Name, Event_ID, Event_Name, Event_Price, Event_Date)*
Membership (Mem_ID*, Mem_Status, Mem_Start, Mem_End, Mem_Paid, Invitation, Attendance)*
Transitive Dependency:
Event_ID -> Event Name, Event_Price, Event_Date
Invitation -> Attendance

3NF*:*
Alumni (Alum_ID, *First_Name, Last_name, Postcode, Country, Subject, Grad_Year)*
Club (Club_ID*, Club_Name)*
Event (Event_ID*, Event_Name, Event_Price, Event_Date)*
Membership (Mem_ID*, Mem_Status, Mem_Start, Mem_End, Mem_Paid)*
Invitation (Inv_ID*, Attendance)*
We added Interests as a separate Entity in the end in our diagram, with a bridge entity between Alumni and Interests.

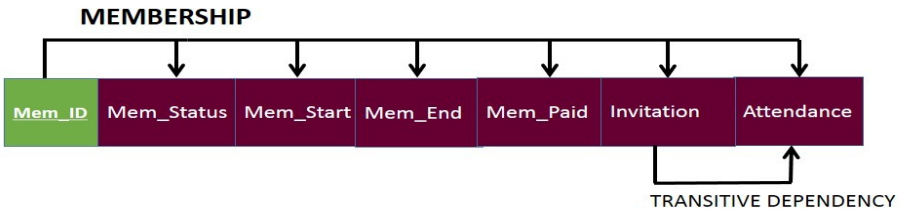
DEPENDENCY DIAGRAM – 1NF



DEPENDENCY DIAGRAM – 2NF

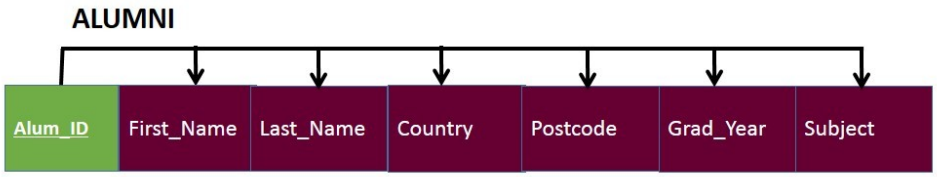


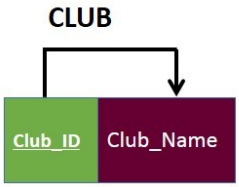
DEPENDENCY DIAGRAM – 2NF

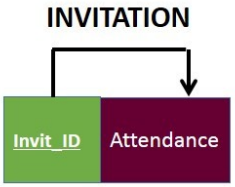


\

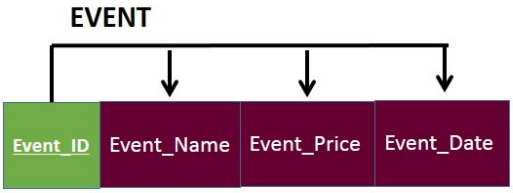
DEPENDENCY DIAGRAM – 3NF

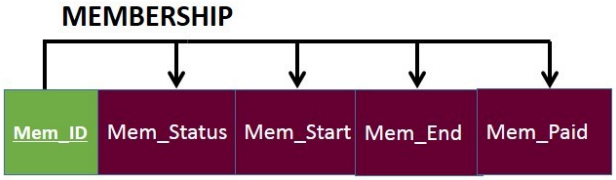




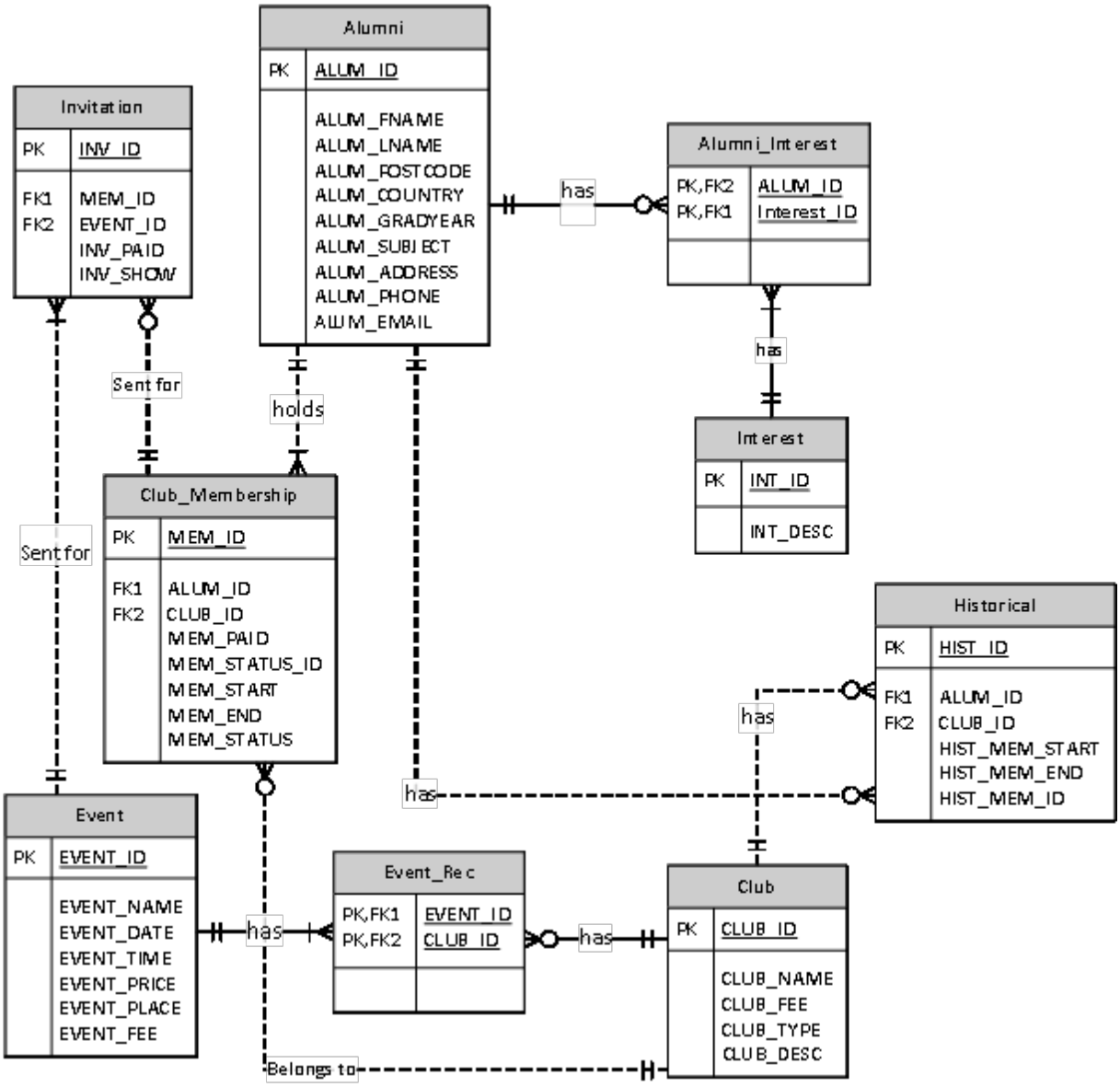


DEPENDENCY DIAGRAM – 3NF





Conceptual View



Sample Data

1. ALUMNI(ALUM_ID, ALUM_FNAME, ALUM_ADDRESS, ALUM_POSTCODE, ALUM_COUNTRY, ALUM_SUBJECT)

ALUM_ID	ALUM_FNAME	ALUM_LNAME	ALUM_ADDRESS	ALUM_POSTCODE	ALUM_COUNTRY	ALUM_SUBJECT
A00963092	Noah	Smith	234 West 8th Ave	V4B 34B	CAN	COMP SCI
A00963022	Liam	Williams	4920 Broadway	B4N I2N	CAN	LAW
A00963132	Malcolm	Brown	9448 Silverthorne Court	J4J N34	CAN	BUSINESS
A00963234	Michael	Rodriguez	392 Alberta Ave	J3K K4K	CAN	SCIENCE
A00964465	Jayden	Taylor	4928 Main St	90210	USA	ARTS

2. ALUMNI_INTEREST(ALUM_ID, INT_ID)

ALUM_ID	INT_ID
A00963022	I2
A00963092	I3
A00963132	I1
A00963234	I8
A00964465	I4

3. INTEREST (INT_ID, INT_DESC)

INT_ID	INT_DESC
I1	Badminton
I2	Soccer
I3	Football
I4	Tennis
I5	Chess
I6	Running
I7	Surfing
I8	Skiing

I9	Snowboarding
I10	Golf

4. INVITATION(INV_ID, MEM_ID, EVENT_ID, INV_PAID, INV_SHOW)

INV_ID	MEM_ID	EVENT_ID	INV_PAID	INV_SHOW
I0000001	M000004	E00001	Yes	Yes
I0000002	M000005	E00001	Yes	No
I0000003	M000001	E00002	Yes	Yes
I0000004	M000002	E00002	No	No
I0000005	M000003	E00002	Yes	Yes
I0000006	M000001	E00003	Yes	Yes
I0000007	M000002	E00003	Yes	Yes
I0000008	M000003	E00003	Yes	Yes
I0000009	M000004	E00003	Yes	Yes
I0000010	M000005	E00003	Yes	Yes
I0000011	M000005	E00004	Yes	Yes
I0000012	M000004	E00005	Yes	Yes

5. MEMBERSHIP(MEM_ID,ALUM_ID, CLUB_ID, MEM_START, MEM_END, MEM_PAID, MEM_STATUS, MEM_STATUS_ID)

MEM_ID	ALUM_ID	CLUB_ID	MEM_START	MEM_END	MEM_PAID	MEM_STATUS	MEM_STATUS_ID
M000001	A00963022	C00002	02-11-2013	02-11-2015	Yes	Active	MSID00001
M000002	A00963092	C00003	04-04-2002	04-04-2015	No	Active	MSID00002
M000003	A00963132	C00003	11-04-2010	11-04-2015	Yes	Active	MSID00003
M000004	A00963234	C00006	01-09-2015	08-09-2016	No	Active	MSID00004

M00000 05	A00964465	C00007	03-29-2012	03-29-2015	Yes	Active	MSID00005

6. EVENT(EVENT_ID, EVENT_NAME, EVENT_DATE, EVENT_TIME, EVENT_PLACE, EVENT_PRICE)

EVENT_ID	EVENT_NAME	EVENT_DATE	EVENT_TIME	EVENT_PLACE	EVENT_PRICE
E00001	Annual Athletics Awards Ceremony	02-20-2015	8:00	Shaw Centre	$55
E00002	Professional Association Club Conference	03-12-2015	12:00	Convention Centre	$77
E00003	Alumni Kick Off	04-07-2015	17:00	Starbucks at Main Street	$98
E00004	Basketball Camp	05-14-2015	9:00	Campus Basketball Gym	$54
E00005	Asia Students Dragonboat Festival	06-12-2015	17:00	UBC Rowing Club	$29

7. CLUB(CLUB_ID, CLUB_NAME, CLUB_DESC, CLUB_FEE, CLUB_TYPE)

CLUB_ID	CLUB_NAME	CLUB_DESC	CLUB_FEE	CLUB_TYPE
C00001	Chess Club	Tournaments	$220	Social
C00002	Philosophy Club	Education	$320	Social
C00003	Law Club	Education	$120	Social
C00004	Soccer Club	Fitness	$230	Sport
C00005	Rugby Club	Fitness	$660	Sport
C00006	Asia Student Club	Social	$230	Social
C00007	Basketball	Basketball at the BCIT Gym 3	$102	Sport

8. EVENT_REC(EVENT_ID, CLUB_ID)

EVENT_ID	CLUB_ID
E00001	C00004
E00001	C00005
E00001	C00007
E00002	C00002
E00002	C00003
E00003	C00001
E00003	C00002
E00003	C00003
E00003	C00004
E00003	C00005

E00003	C00006
E00003	C00007
E00004	C00007
E00005	C00006

9. HISTORICAL(HIST_ID, ALUM_ID, CLUB_ID, FEE_BALANCE, HIST_MEM_START, HIST_MEM_END, HIST_MEM_ID)

HIST_ID	ALUM_ID	CLUB_ID	FEE_BALANCE	HIST_MEM_START	HIST_MEM_END	HIST_MEM_ID
H0000001	A00862302	C00002	$50	04-17-2010	04-17-2011	M000006
H0000002	A00843392	C00003	$102	05-05-2002	05-05-2006	M000022
H0000003	A00862302	C00003	$402	04-17-2010	04-17-2011	M000041
H0000004	A00623234	C00006	$30	01-09-2002	08-09-2007	M000024
H0000005	A00644465	C00007	$32	03-29-2012	03-29-2014	M000015

Sample Reports

1. What are all the events that the Members have invited to and their attendance record?

Alumni Query

ALUM_ID	ALUM_FNAME	ALUM_LNAME	ATTEND_REC	EVENT_NAME
A00963022	Liam	Williams	Yes	Professional Association Club Conference
A00963022	Liam	Williams	Yes	Alumni Kick Off
A00963092	Noah	Smith	No	Professional Association Club Conference
A00963092	Noah	Smith	Yes	Alumni Kick Off
A00963132	Malcolm	Brown	Yes	Professional Association Club Conference
A00963132	Malcolm	Brown	Yes	Alumni Kick Off
A00963234	Michael	Rodriguez	Yes	Annual Athletics Awards Ceremony
A00963234	Michael	Rodriguez	Yes	Alumni Kick Off
A00963234	Michael	Rodriguez	Yes	Asia Students Dragonboat Festival
A00964465	Jayden	Taylor	No	Annual Athletics Awards Ceremony
A00964465	Jayden	Taylor	Yes	Alumni Kick Off

A00964465	Jayden	Taylor	Yes	Basketball Camp

2. Who Attended the Professional Club Conference event?

ALUMNI Query				
ALUM_ID	**ALUM_FNAME**	**ALUM_LNAME**	**ATTEND_REC**	**EVENT_NAME**
A00963022	Liam	Williams	Yes	Professional Association Club Conference
A00963132	Malcolm	Brown	Yes	Professional Association Club Conference

Note: Noah Smith paid for the event but did not attend.

3. What Interests did people who Joined the Law Club have?

INT_ID	INT_DESC	CLUB_NAME	CLUB_TYPE	CLUB_ID
I1	Badminton	Law Club	Social	C00003
I3	Football	Law Club	Social	C00003

Badminton and Football