TOUR AGENCY DATABASE
Keeping track of the accountancy

Author: Ulises E. Sosa

Student Num: 17670

29/01/2021

Guided tours

A tour agency sells guided tours to two types of clients, and has different rates for each of them, they in turn sell the tours to their final customers which are groups of people. The guides deliver the tours in one or two languages, but to work for the agency they must speak at least three. The company covers different cities and has a base in some of the cities where it works. The guides are based in the cities where they mainly work but can work in any of the other locations where the company delivers tours, and in this case get paid the transfer, however a guide can work in transfer a maximum of three times per month. The day worked can be categorized in two: full day where the guide does one tour that lasts at least 7 hours, or half day where the tour lasts up to 3,5 hours. When the tour lasts only 3,5 hours a guide can work twice in the same day to reach a full day but it is not always the case. If the tour is delivered in two languages the guide earns extra money per tour basis. On the company side the selling of a tour has a different price depending on the customer (cruise-ship, agencies) and a fixed cost per guide, language, and transfer.

Glossary

Term	Description	Synonyms	Connections
Client	Direct customer of the agency	Customer	-Group, Tour
Guide	Guides a tour	-	-Branch, Tour, Language, Group
City	A city where the tour is delivered, it can have a branch of the agency but is not always the case	Branch	Tour
Tour	Tour organized by the company, carried out by a guide with a group	-	Guide, Group, Client
Language	The language spoken	-	Guide, Group
Group	The people participating in the the tour.	-	Language, Tour, Guide
Base	It is a branch of the agency placed in a specific city where tours are delivered	-	Guide
Cruise ship	It a client of the company. Cruise ships belonging to different liners such as Costa, MSC, Cunard, etc	-	Tour, Group

Structured Requirements

General statement: We want to produce a database for a company that provides guided tours. The database is intended to keep track of the accounting of a branch.

Statement concerning clients: A client is can be a cruise ship or another agency that through our agency delivers a tour to their final customers.

Statement concerning groups: A group of people that participate on the tour. The group can speak one or two languages.

Statement concerning guides: A guide is a person that delivers the tour to a group, it lives in a city where there is a branch. It speaks at least three languages, can deliver a tour at most in two languages. If it does a tour on a city where s/he does not live gets paid extra for the transfer.

Statement concerning Tours: delivered to a group by a guide on a city. It is requested by a client.

Statement concerning Cities: can be place where a branch is established and/or the tours are held.

Data Dictionary

Guide: name,PK Code, telephone

Client: Tax_Code PK , name

Language: PK Language_Id, name

Tour: Code PK, Name, End_time PK,Start_time PK

City: PK CAP, name

Base: Address, CAP

Cruise ship: port_of_departure, num_pax, Tax_code

Group: group_ID, date, time,num_pax

Relationships

Requests : price, Date PK,client FK, Tour FK, Start_time FK, End_time FK

Lives: Guide, City

Is_in: Tour FK, Start_time FK, End_time FK

Delivers: final_price, Tour, start_time,end_time,group,date, guide

Reserves:Group, date, Client,Price,Tour, start_time._end_time

Speaks:Language, Group

Is_fluent_in: Guide FK, Language FK

Relationships

- Lives(between Guide and Branch)
- isFluentIn(between Guide and Language)
- speaks(between Language and Group)
- delivers(between Guide and Tour)
- reserves(between Client and Group)
- isIn(between Tour and City)
- requests (between Client and Tour)
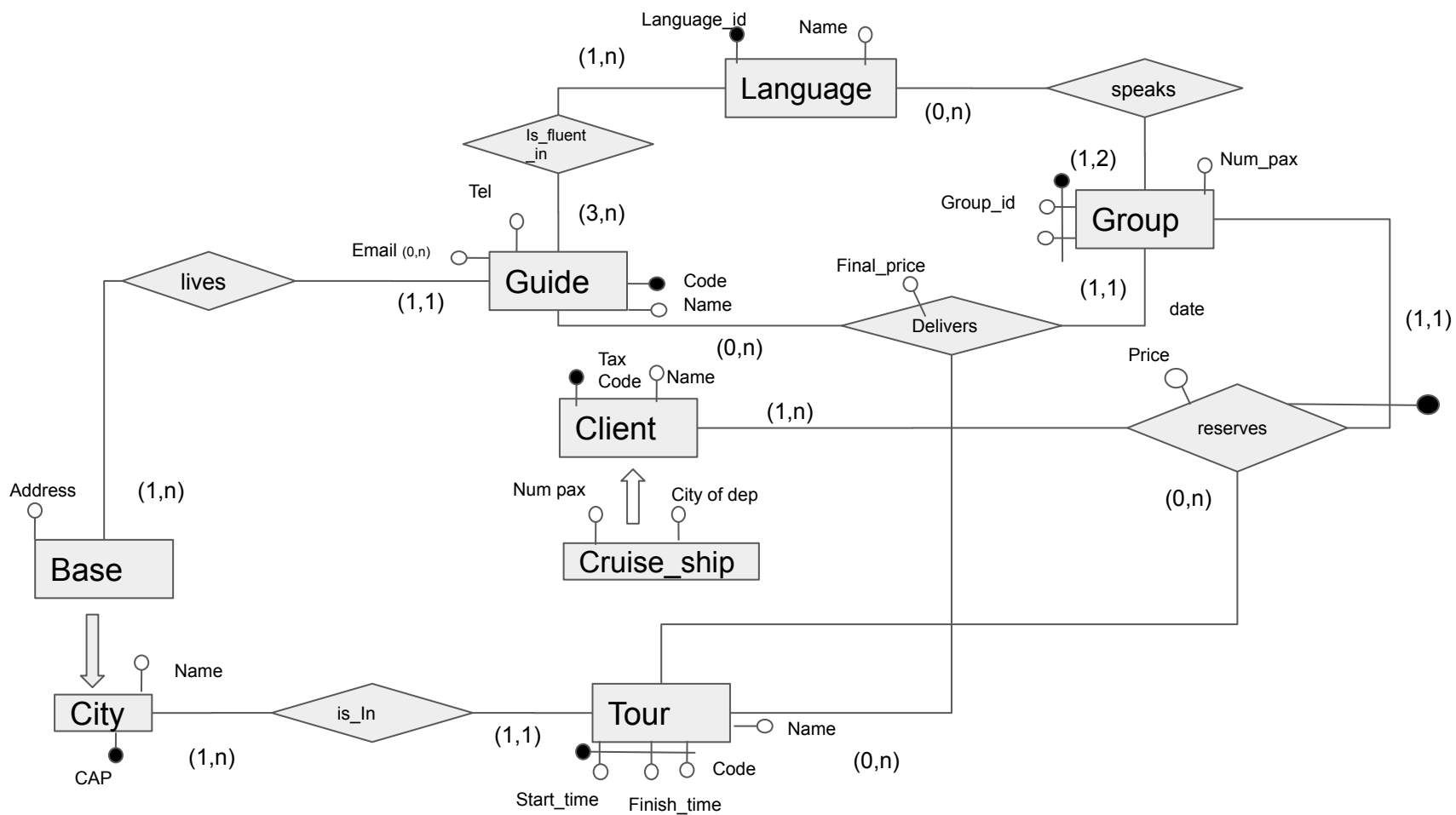
External constraints

- A Guide can do at most two 3.5 hours tours, or one 7 hours tour
- 7 hour tours can only start up to 10 am
- A Guide that delivers a tour in a city different than its residence must have added an extra amount on the tour price.
- The base price of a tour is extracted from the price attribute of the request relationship
- A guide cannot be assigned two tours at overlapping hours on the same date
- A guide can work in transfer a maximum of three times per month.

Concept	Construct	Volume
Language	Entity	10
Group	Entity	600
Guide	Entity	30
Tour	Entity	15
Client	Entity	20
City	Entity	15
Lives	Relationship	30
is_Fluent_In	Relationship	100
Speaks	Relationship	70
Delivers	Relationship	600 => max card (1,1)
Reserves	Relationship	600
isIn	Relationship	15
Base	Entity	10
Cruise_ship	Entity	15

Application Load

Op 1 : How much did a guide earn in a month(read) (Batch operation 1 a month) Total accesses = 21

Concept	Construct	Accesses	Type
Guide	Entity	1	R
Delivers	Relationship	20	R

Application Load

Op 2 : Assign a tour to a guide Total cost = 15 accesses

Concept	Construct	Accesses	Type
Guide	Entity	1	R
Tour	Entity	1	R
Group	Entity	1	W
is_Fluent_in	Relationship	1	R
speaks	Relationship	1	W
reserves	relationship	1	W

Op 2 : Assign a tour to a guide-cont.
Total cost = 15 accesses

Concept	Construct	Accesses	Type
Delivers	Relationship	1	W
lives	RelationShip	1	R
is_in	Relationship	1	R
Client	Entity	1	R
Cruise Ship	Entity	1	R

Application Load

Op 3 : Which tours did the guide do in transfer

Total cost = 5 accesses

Concept	Construct	Accesses	Type
Guide	Entity	1	R
Lives	Entity	1	R
Tour	Entity	1	R
is_In	Relationship	1	R
Delivers	Relationship	1	R

Application Load

Op 4 : Which tour is the most popular on a specific month
Total cost = 615 accesses

Concept	Construct	Accesses	Type
Tour	Entity	15	R
Delivers	Relationship	600	R

600 reads in the table of delivers to count for each group
how many time it has been done

Application Load

Op 5 : Which is the most loyal client
Total cost = 620 accesses

Concept	Construct	Accesses	Type
Reserves	Relationship	600	R
Client	Entity	20	R

Application Load

Op 6 : Insert a guide in the database
Total cost = 10 accesses (write counts as 2 * read)

Concept	Construct	Accesses	Type
Guide	Entity	1	W
is_Fluent_in	Relationship	3	W
Lives	Relationship	1	W

Operations

- How much did a guide earn in a month? (read) - Once a month, batch op.

  Total cost = 30 guides * 41 operations = 1200 once a month

- Assign a tour to a guide. (write)

  600 tours * 15 operations = 9000 operations in a month

- Which tours did the guide do in transfer?

  30 guides * 5 operations = 150 in a month

Operations

- Which tour is the most popular on a specific month
  615 operations once in a month

- Which is the most loyal client?

  620 operations once a month.

- Insert a guide in the database. (write)

  30 guides * 10 = 300 operations once.

Restructuring the ER Schema

Table of volumes restructured

Concept	Construct	Volume
Language	Entity	10
Group	Entity	600
Guide	Entity	30
Tour	Entity	15
Client	Entity	20
City	Entity	15
Lives	Relationship	30
is_Fluent_in	Relationship	100
Speaks	Relationship	70
Reserves	Relationship	600
is_In	Relationship	15

Concept	Construct	Volume
ISA-C-CrSh	Relationship	15
B-ISA-C	Relationship	15
has_Email	Relationship	20
Email	Entity	20
Base	Entity	10
Cruise_ship	Entity	15

Restructured application load

Op 6 : Insert a guide in the database
Total cost = 14 accesses (write counts as 2 * read)

Concept	Construct	Accesses	Type
Guide	Entity	1	W
is_Fluent_in	Relationship	3	W
Lives	Relationship	1	W
Email	Entity	1	W
Has_Email	Relationship	1	W

Operations

- Which tour is the most requested by a client?

  615 operations once in month

- Which is the most loyal client?

  620 operations once a month.

- Insert a guide in the database. (write)

  30 guides * 14 = 420 operations once.

Data Dictionary

Guide: name, PK Code, telephone

Client: Tax Code PK , name

Language: PK name

Tour: Code PK, Name,Start_time PK, End_time PK

City:CAP, name

Base: Address, CAP

Cruise_ship: port of departure, num pax, Tax code

Group: Group_id, date, num_pax

Email: address PK

Relationships

Requests : price,date PK,group PK, client FK, tour FK, Start_time FK, End_time FK
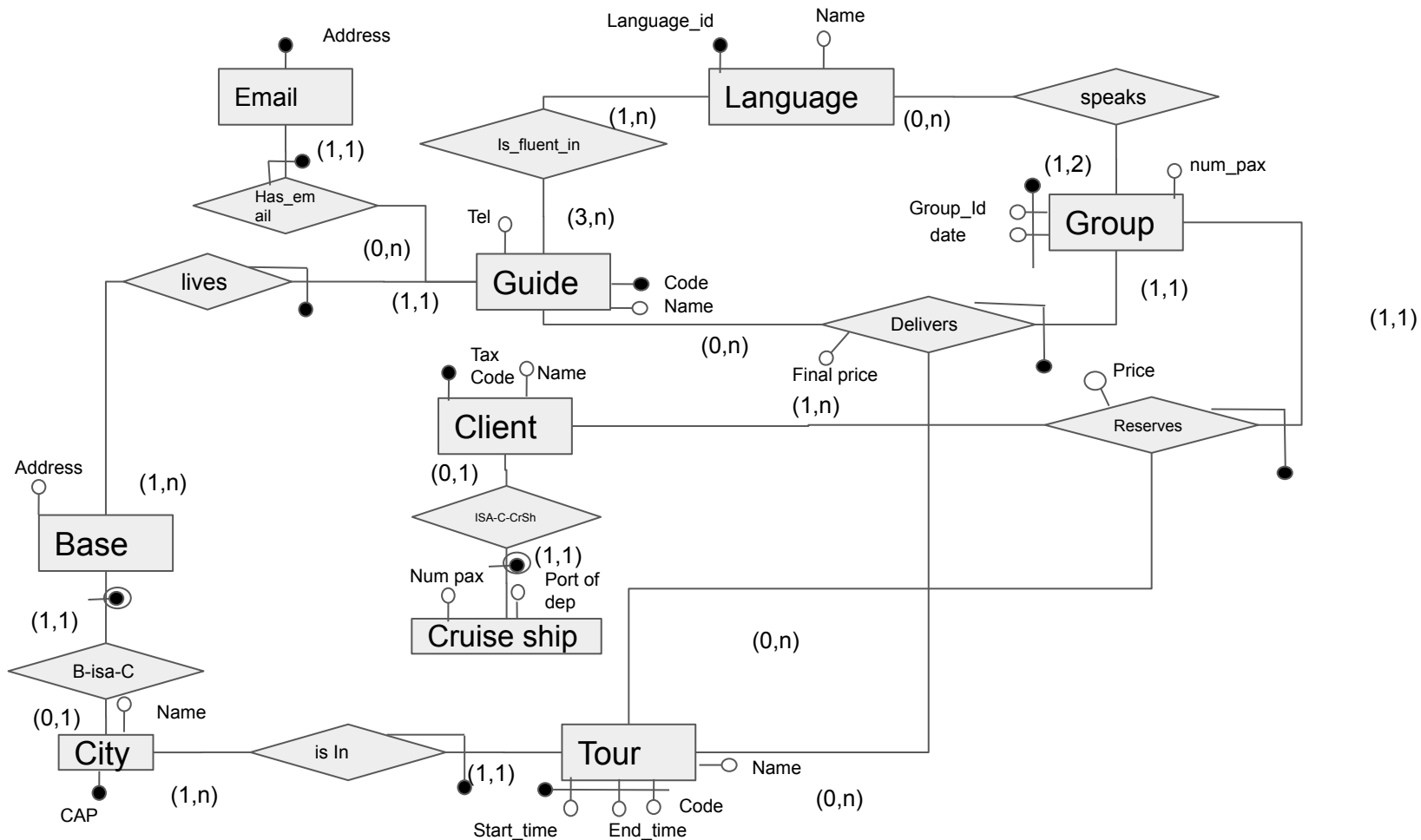
Lives: Guide, Base

Is_in: Tour ,Start_time, End_time, City

Delivers: final_price, Date FK, Group FK, Guide FK, Tour FK,End_time FK,Start_time FK

Speaks: Group, Language

Is_fluent_in: Guide, Language

Has_email: Guide, Email

Entity-Relationship diagram:

- **Email** (Address) — Has_email (1,1)
- **Language** (Language_id, Name)
- Is_fluent_in (1,n) / (3,n)
- speaks (0,n)
- **Group** (Group_Id, date, num_pax) (1,2)
- Has_email (0,n)
- lives (0,n) / (1,1)
- **Guide** (Tel, Code, Name)
- Delivers (0,n) / (Final price) (1,1)
- Reserves (Price) (1,n) / (1,1)
- **Client** (Tax Code, Name)
- **Base** (Address) (1,n) / (1,1)
- ISA-C-CrSh (0,1) / (1,1)
- **Cruise ship** (Num pax, Port of dep)
- B-isa-C (1,1) / (0,1)
- **City** (Name, CAP) (1,n)
- is In (1,1)
- **Tour** (Start_time, End_time, Code, Name) (0,n)

26

Direct Translation

Cruise ship(port_of_departure, num_pax, **Tax_code**)

Base(Address, **CAP**)
Foreign Key: Base[CAP] ⊆ City[CAP]
Inclusion: Base[CAP] ⊆ Lives[Base]

Group(**Group_id**,**Date,**num_pax)
Inclusion: Group[Group_ID] ⊆ speaks[Group]
Foreign key: Group[Group_ID] ⊆Reserves[Group]
Foreign key: Group[Date] ⊆ Reserves[Date]
Foreign key:Group[Group_ID] ⊆ Delivers[Group]
Foreign key: Group[Date] ⊆Delivers[Date]

Delivers(Guide,Tour,Start_time, End_time, Group, Date)
Foreign key: Delivers[Date] ⊆ Group[Date]
Foreign key: Delivers[Group_ID] ⊆ Group[Group]
Foreign key: Delivers[Client] ⊆ Client[Tax_code]
Foreign key: Delivers[Start_time] ⊆ Tour[Start_time]
Foreign key: Delivers[End_time] ⊆ Tour[End_time]
Foreign key: Delivers[Tour] ⊆ Tour[Code]

Direct Translation

Guide(name,**Code**, telephone)
Inclusion: Guide[Code] ⊆ Is_fluent_In[Guide]
Foreign key: Guide[Code] ⊆ lives[Guide]

Client(**Tax Code** , name)
Inclusion: Client[Tax_Code] ⊆ Resves[Client]

Language(Language_id,name)
Inclusion: Language[Language_id] ⊆ is_fluent_In[Language]

Tour(**Code**, Name**, Start time, End_time**)
Foreign key: Tour[End_time] ⊆ is_In[End_time]
Foreign key: Tour[Start_time] ⊆ is_In[Start_time]
Foreign key: Tour[Code] ⊆ is_In[Tour]

Direct Translation

Reserves(Group,Date, price,Client, start_time,end_time,tour)
Foreign key: Reserves[group] ⊆ Group[group_ID]
Foreign key: Reserves[date] ⊆ Group[date]
Foreign key: Reserves[Client] ⊆ Client[Tax_code]
Foreign key: Reserves[start_time] ⊆ Tour[start_time]
Foreign key: Reserves[end_time] ⊆ Tour[end_time]
Foreign key: Reserves[tour] ⊆ Tour[code]

Speaks(Group, date,Language)
Foreign key: Speaks[Group] ⊆ Group[Group_ID]
Foreign key: Speaks[date] ⊆ Group[date]
Foreign key: Speaks[Language] ⊆ Language[language_id]

Is_fluent_in(Guide, Language)
Foreign key: Is_fluent_in[Language] ⊆ Language[Language_id]
Foreign key:Is_fluent_in[Guide] ⊆ Guide[Code]

Email(Address)
Foreign key: Email[Address] ⊆ has_Email[Email]

has_Email(Email, Guide)
Foreign key: has_Email[Email] ⊆ Email[Address]
Foreign key: has_Email[Guide] ⊆ Guide[Code]

Direct Translation

Lives(Guide,Base)
Foreign key: Lives[Guide] ⊆ Guide[ID]
Foreign key: Lives[Base] ⊆ Base[CAP]

Is_in (Tour, Start time, End_time, City)
Foreign key: Is_in[Tour] ⊆ Tour[Code]
Foreign key: Is_in[End_time] ⊆ Tour[End_time]
Foreign key: Is_in[Start_time] ⊆ Tour[Start_time]
Foreign key: Is_in[City] ⊆ City[CAP]

City(**CAP**, name)
Inclusion: City[CAP] ⊆ Is_In[City]

Restructuring of Logical scheme

Merging Email into hasEmail

hasEmail(**Email,** Guide)
Foreign Key: hasEmail[Guide] ⊆ Guide[Code]

Merging lives into Guide

Guide(name,**Code**, telephone, Base**)**
Inclusion: Guide[Code] ⊆ Is_fluent_In[Guide]
Foreign key: Guide[Base] ⊆ Base[CAP]

Merging is_In into Tour

Tour(**Code**, Name, **End_time, Start time,** City)
Foreign key: Tour[City] ⊆ City[CAP]

Restructuring of Logical schema

Complete and final set of tuples

Tour(**Code**, Name,**Start time, End_time,** City)
Foreign key: Tour[City] ⊆ City[CAP]

City(**CAP**, name)
Inclusion: City[CAP] ⊆ Tour[City]

Guide(name,**Code**, telephone,Base**)**
Inclusion: Guide[Code] ⊆ Is_fluent_In[Guide]
Inclusion:Guide[Base] ⊆ Base[
Foreign key: Guide[Base] ⊆ Base[CAP]

has_Email(Email, Guide)
Foreign key: has_Email[Email] ⊆ Email[Address]
Foreign key: has_Email[Guide] ⊆ Guide[Code]

Restructuring of Logical schema

Complete and final set of tuples -cont.

Reserves(Group,Date,start_time,end_time,tour,price,Client)
Foreign key: Reserves[group] ⊆ Group[group_ID]
Foreign key: Reserves[date] ⊆ Group[date]
Foreign key: Reserves[start_time] ⊆ Tour[start_time]
Foreign key: Reserves[end_time] ⊆ Tour[end_time]
Foreign key: Reserves[tour] ⊆ Tour[code]
Foreign key: Reserves[Client] ⊆ Client[Tax_code]

Speaks(Group,Date,Language)
Foreign key: Speaks[Group] ⊆ Group[Group_ID]
Foreign key: Speaks[Date] ⊆ Group[Date]
Foreign key: Speaks[Language] ⊆ Language[Language_id]

Restructuring of Logical schema

Complete and final set of tuples -cont.

Language(<u>Language_id</u>, name)
Inclusion: Language[Language_id] ⊆ is_fluent_In[Language]

Base(Address, **CAP**)
Foreign Key: Base[CAP] ⊆ City[CAP]
Inclusion: Base[CAP] ⊆ Guide[Base]

Group(**Group_id**,<u>Date</u>,num_pax)
Inclusion: Group[group_ID] ⊆ speaks[Group]
Inclusion: Group[date] ⊆ speaks[date]
Foreign key: Group[group_ID] ⊆ Reserves[Group]
Foreign key: Group[date] ⊆ Reserves[date]
Foreign key:Group[group_ID] ⊆ Delivers[Group]
Foreign key:Group[date] ⊆ Delivers[date]

Client(<u> Tax_code</u>, name)
inclusion:Client[Tax_code]⊆ Reserves[Client]

Cruise ship(port_of_departure, num_pax, **Tax_code**)

Restructuring of Logical schema

Complete and final set of tuples -cont.

Is_fluent_in(<u>Guide</u>, <u>Language</u>)
Foreign key: Is_fluent_in[Language] ⊆ Language[Language_id]
Foreign key:Is_fluent_in[Guide] ⊆ Guide[Code]

Delivers(Guide,Tour,Start_time, End_time, <u>Group, Date</u>)
Foreign key: Delivers[Date] ⊆ Group[Date]
Foreign key: Delivers[Group_ID] ⊆ Group[Group]
Foreign key: Delivers[Start_time] ⊆ Tour[Start_time]
Foreign key: Delivers[End_time] ⊆ Tour[End_time]
Foreign key: Delivers[Tour] ⊆ Tour[Code]
Foreign key: Delivers[Guide] ⊆ Guide[Code]

Application Load

Op 1 : How much did a guide earn in a month(read) (Batch operation 1 a month)
Total accesses = 21

Concept	Construct	Accesses	Type
Guide	Entity	1	R
Tour	Entity	20	R

Application Load

Op 2 : Assign a tour to a guide
Total cost = 12 accesses

Concept	Construct	Accesses	Type
Guide	Entity	1	R
Tour	Entity	1	R
Group	Entity	1	R
is_Fluent_in	Relationship	1	R
speaks	Relationship	1	W
Reserves	Relationship	1	W
Delivers	Relationship	1	W
Client	Entity	1	1
Cruiseship	Entity	1	1

Application Load

Op 3 : Which tours did the guide do in transfer

Total cost = 2 accesses

Concept	Construct	Accesses	Type
Guide	Entity	1	R
Group	Entity	1	R

Application Load

Op 4 : Which tour is the most popular on a specific month
Total cost = 615 accesses

Concept	Construct	Accesses	Type
Tour	Entity	15	R
Delivers	Relationship	600	R

Application Load

Op 5 : Which is the most loyal client
Total cost = 620 accesses

Concept	Construct	Accesses	Type
Reserves	Relationship	600	R
Client	Entity	20	R

Application Load

Op 6 : Insert a guide in the database
Total cost = 10 accesses (write counts as 2 * read)

Concept	Construct	Accesses	Type
Guide	Entity	1	W
is_Fluent_in	Relationship	3	W
has_Email	Relationship	1	W

Operations

- How much did a guide earn in a month? (read) - Once a month, batch op.

  Total cost = 30 guides * 21 operations = 630 once a month

- Assign a tour to a guide. (write)

  600 tours * 12 operations = 7200 operations in a month

- Which tours did the guide do in transfer?

  30 guides * 2 operations = 60 in a month

Operations

- Which tour is the most popular on a specific month
  615 operations once in a month

- Which is the most loyal client?

  620 operations once a month.

- Insert a guide in the database. (write)

  30 guides * 10 = 300 operations once.

Constraints

- A Guide can do at most two 3.5 hours tours, or one 7 hours tour
- A tour of 7 hours can start up to 10 am
- A Guide that delivers a tour in a city different than its residence must have added an extra amount on the tour price.
- The base price of a tour is extracted from the price attribute of the request relationship
- A guide cannot be assigned two tours at overlapping hours on the same date
- A guide can work in transfer a maximum of three times per month.