

Database Systems Coursework 1

PG Group 13

Tazim Chowdhury

Matvey Ivashko

Kyle Benoit

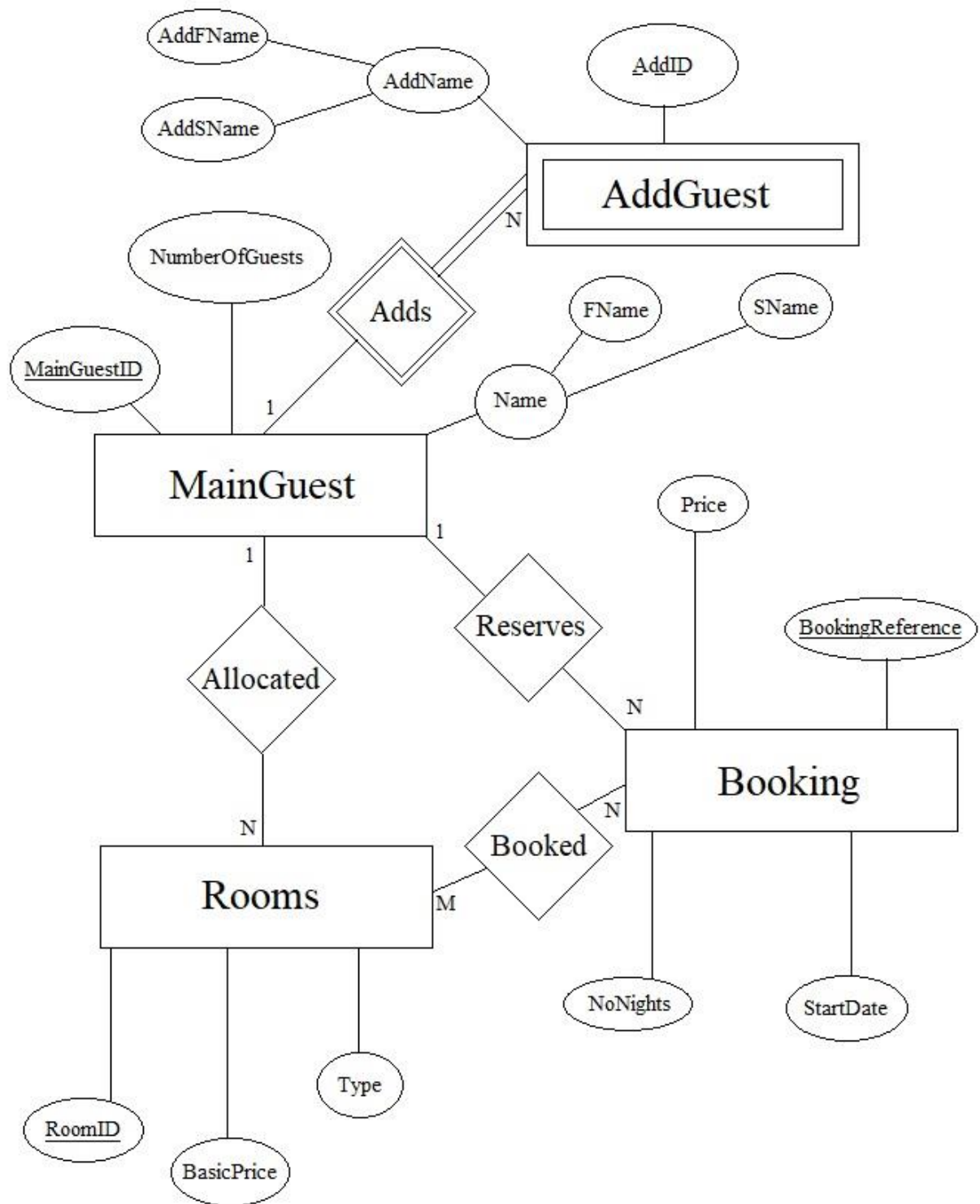
Athina Skourta

We have chosen **The Hotel System** as our coursework topic.

The list of assumptions we made:

1. There is one main guest who can add multiple additional guests.
2. There are four entities. The add guest is a weak entity because its existence depends on the Main Guest entity. The relationship between them is one to many (1: N). As a result, one main guest can have many additional guests. However, one additional guest can only have one main guest.
3. The system is responsible to allocate the available rooms to the guests by taking into account that each room can hold up to a maximum of three guests.
4. The main guest can book multiple rooms. A room can only be booked by one main guest during the same booking period (1: N).
5. The relationship between booking and rooms entity is many to many (N: M). This is because; a room can be booked multiple times provided that the booking period is different. Similarly, a booking period can be reserved for many rooms.
6. There are three types of rooms excellent, deluxe and magnificent with different basic price. There is an extra cost for every additional guest. The final price is calculated by the room's basic price multiplied by the number of nights and then adding the cost of additional guests.

The conceptual schema (ER diagram):



Relationship database schema:

Table 1: Main Guest

Primary Key: MainGuestID

<u>MainGuestID</u>	Name	NumberGuests
41111	John Smith	0
42222	Mark Seth	1
43333	Ross Geller	2

Table 2: AddGuest

Primary Key: AddID

Foreign Key: MainGuestID

<u>AddID</u>	AddName	MainGuestID
42111	Anthony Phillips	42222
43111	Rachel Green	43333
43313	Sarah White	43333

Table 3: Rooms

Primary Key: RoomID

Foreign Key: GuestID

<u>RoomID</u>	Type	BasicPrice £	MainGuestID
111	Excellent	1000	41111
122	Deluxe	2000	42222
133	Magnificent	3000	43333

Table 4: Booking

Primary Key: BookingReference

Foreign Key: RoomID

<u>BookingReference</u>	StartDate	NoNights	RoomId	Price	MainGuestID
11141111	15 Feb 2017	7	111	7000	41111
12242222	21 June 2018	5	122	11000	42222
13343333	7 December 2018	12	133	43200	43333

The normalized design, and its explanation:

Main Guest

Primary key: MainGuestID

<u>MainGuestID</u>	Name	NumberGuests
41111	John Smith	0
42222	Mark Seth	1
43333	Ross Geller	2

Additional Guests

Primary Key: AddID

Foreign Key: MainGuestID

<u>AddID</u>	Name
42111	Anthony Phillips
43111	Rachel Green
43313	Sarah White

<u>AddID</u>	MainGuestID
42111	42222
43111	43333
43313	43333

Rooms

Primary Key: RoomID

Foreign Key: MainGuestID

<u>RoomID</u>	MainGuestID	Type
111	41111	Excellent
122	42222	Deluxe
133	43333	Magnificent

Room Type

Primary Key: Type

<u>Type</u>	BasicPrice
Excellent	1000
Deluxe	2000
Magnificent	3000

Booking

Primary Key: BookingReference

<u>BookingReference</u>	StartDate
11141111	15 Feb 2017
12242222	21 June 2018
13343333	7 December 2018

FinalPrice

Primary Key: BookingReference

<u>BookingReference</u>	Price	NoNights
11141111	7000	7
12242222	11000	5
13343333	43200	12

RoomBooking

Primary Key: BookingReference

Foreign Key: RoomID

<u>BookingReference</u>	RoomID
11141111	111
12242222	122
13343333	133

A normalized relational diagram is in 4th normal form when it has no multivalued dependencies and complies with the restrictions of 3rd, 2nd and 1st normal form.

Firstly, all values at the intersections between columns and rows contain atomic values (i.e. the values cannot be subdivided into smaller constituents and still represent the attributes). Therefore, all relations are in 1st normal form.

Second normal form restricts the relations from have attributes being dependent on only part of the primary key. There are no composite primary keys in any of our relations and all attributes are functionally dependent on them. Therefore, all of the relations meet this criterion.

In addition, all relations are in 3rd normal form because they have no transitive dependencies. The 'room' relation was divided into the relations 'Rooms' and 'Room Type' to avoid the transitive dependency between 'RoomID' and 'BasicPrice'. The attribute 'Type' was enabling this transitive dependency so the relation was divided.

Lastly our relations (tables) do not have multivalued dependencies and therefore are in 4th normal form. For example, the 'Booking' relation originally had multivalued dependencies; the 'RoomID' is dependent on the 'BookingReference' but not on 'Price' and 'NoNights'. Also, the NoNights and Price are dependent on each other as well as 'BookingReference'. Lastly, 'StartDate' is dependent on 'BookingReference' but independent of the other attributes. Therefore, the Booking relation was divided into three new relations namely 'Booking', 'FinalPrice' and 'RoomBooking'.