TDT4145
Datamodellering og Databasesystemer
DB1

Gruppe 113

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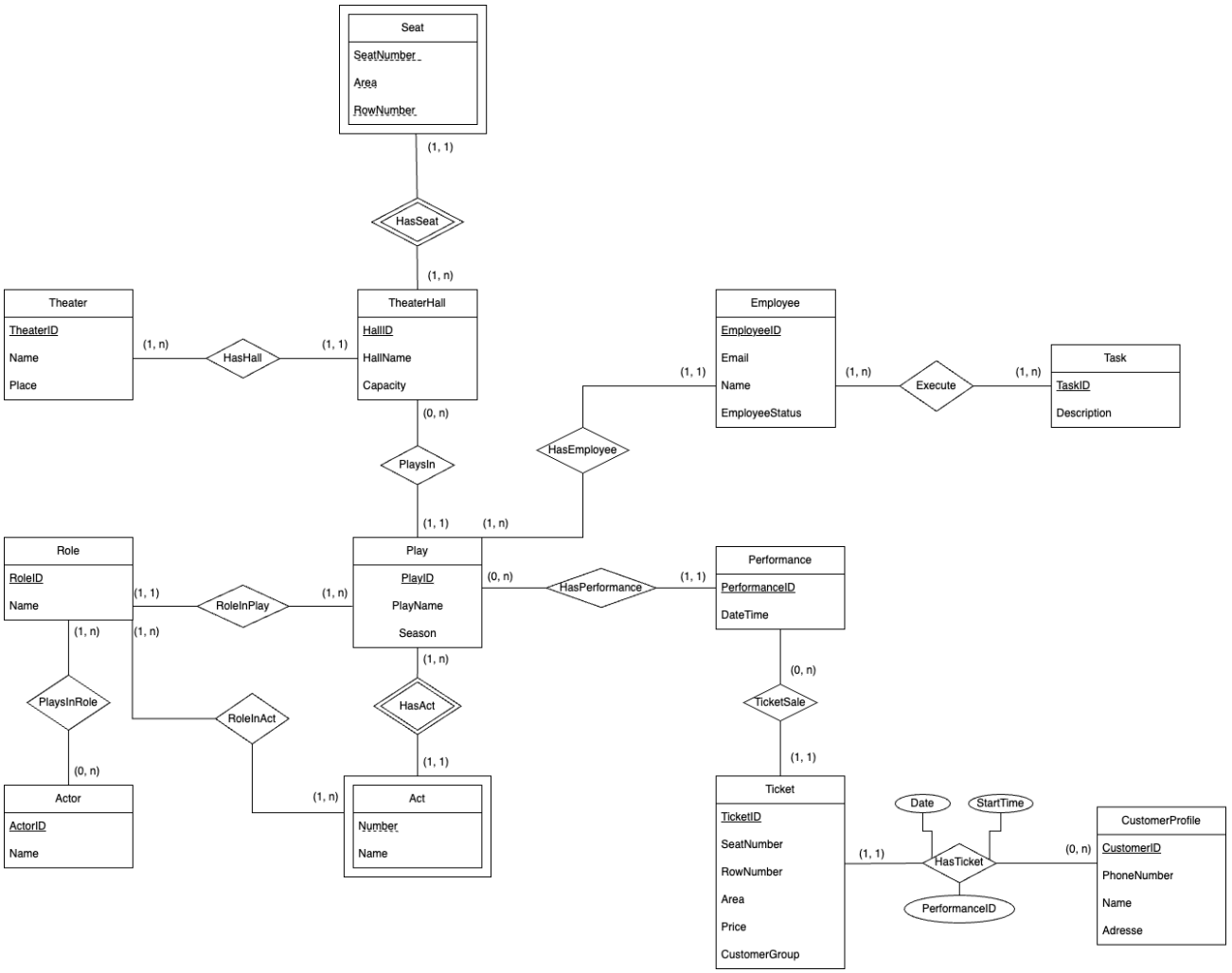
a) ER-diagram



Assumptions and restrictions

- A Theater must have at least one Theater hall.
- A play cannot be performed without a Theater hall. We also assume that a Theater play must have at least one role.
- A performance can sell zero tickets.
- A Theater hall must have at least one seat. Furthermore, we assume that there can be several plays in one Theater hall, however this has to be in different seasons.
- A ticket cannot exist without a performance. This means that a performance must be settled before tickets can be sold. Furthermore, a ticket can not exist without a customer profile. This means that we assume that tickets are created when a customer buys the ticket.
- We assume that an act must have at least one role playing.

- We assume that an actor does not have to be linked to a role. If this is the case the actor is not a part of the play. Furthermore, if a role is not given a name. Then the actor playing that role is playing himself.
- We assume that an employee has to be related to a play. Furthermore we assume that a task has to be occupied by an employee and an employee must have at least one task.

b) *Relational database*

Theater

TheaterID	Name	Place

- TheaterID is primary key, this cannot be NULL

TheaterHall

HallID	HallName	Capacity	TheaterID

- HallID is the primary key, this cannot be NULL.
- TheaterID is foreign key towards the Theater table, this cannot be NULL.

Play

PlayID	PlayName	Season	HallID

- PlayID is primary key, this cannot be NULL
- Season needs to be verified in software and cannot be NULL.
- HallID is foreign key towards the TheaterHall table, this cannot be NULL.

Performance

PerformanceID	Date	Time	PlayID

- PerformanceID is the primary key, this cannot be NULL.
- PlayID is foreign key towards the Play table, this cannot be NULL.

Employee

EmployeeID	Email	Name	EmployeeStatus	PlayID

- EmployeeID is primary key, this cannot be NULL
- PlayID is foreign key towards the Play table, this cannot be NULL.

Role

RoleID	Name	PlayID

- RoleID is the primary key, this cannot be NULL.
- PlayID is foreign key against the Play table, this cannot be NULL.

Actor

ActorID	Name

- ActorID is the primary key, this cannot be NULL.

Seat

SeatNumber	RowNumber	Area	HallID

- SeatNumber, RowNumber, Area and HallID together is the PK. None of these can be NULL
- HallID is foreign key towards the Hall table.

Ticket

TicketID	Price	Customer Group	TimeOfSale	PerformanceID	CostumerID	SeatID

- TicketID is the primary key, this cannot be NULL.
- PerformanceID is foreign key towards the Performance table, and cannot be NULL.
- CustomerID is foreign key towards the Customer table and cannot be NULL.
- SeatID is a foreign key towards the Seat table and cannot be NULL.

CustomerProfile

CustomerID	PhoneNumber	Name	Address

- CustomerID is the primary key and cannot be NULL.

Task

TaskID	Description

- TaskID is the primary key, and cannot be NULL.

Act

Number	Name	PlayID

- Number and PlayID together is the primary key for the Act table. None of these can be NULL.
- PlayID is a foreign key against the Play table.

RoleInAct

RoleID	PlayID	Number

- Here we got RoleID that is a foreign key towards the Role table.
- We got PlayID and Number, which together is a foreign key towards the Act table.
- Role, PlayID and Number together is the primary key, none of these can be zero.

PlaysInRole

RoleID	ActorID

- RoleID is foreign key against the Role table.
- ActorID is foreign key against the Actor table.

Execute

EmployeeID	TaskID

- EmployeeID is foreign key towards the Employee table.
- TaskID is foreign key towards the Task table.
- EmployeeID and TaskID together is the primary key, none of these can be NULL.
- There is also a participation requirement in the execute table. This means that all tasks have to participate in the execute table, and all employees have to participate in the execute table.

Normal forms

Theater

- 1NF: Every attribute in the table is unique, and none of the cells contain multivalued values.
- 2NF: TheaterID is the only candidate key, and both name and place are fully dependent on this key.
- 3NF: There are no transitive dependencies between the attributes.
- BCNF: Both name and place are directly given by TheaterID, and TheaterID is a superkey.
- 4NF: There are no multivalued dependencies. So the table is in 4NF.

TheaterHall

- 1NF: Every attribute in the table is unique, and none of the cells contain multivalued values.
- 2NF: HallID is the only candidate key, and both HallName, capacity and TheaterId are fully dependent on this key.
- 3NF: All non-key attributes are directly dependent on the candidate key. In other words, there are no transitive dependencies.
- BCNF: HallID is a superkey, and all other attributes are directly dependent on the superkey.
- 4NF: There are no multivalued dependencies. So the table is in 4NF.

Play

- 1NF: Every attribute in the table is unique, and none of the cells contain multivalued values.
- 2NF: PlayID is the only candidate key. All the other attributes depend on the PlayID.
- 3NF: All non-key attributes are directly dependent on the candidate key. In other words, there are no transitive dependencies.
- BCNF: PlayID is a superkey, and all other attributes are directly dependent on the superkey.
- 4NF: There are no multivalued dependencies. So the table is in 4NF.

Performance

- 1NF: Every attribute in the table is unique, and none of the cells contain multivalued values.
- 2NF: PerformanceID is the only candidate key. The other attributes depend on the performanceID.
- 3NF: There are no transitive dependencies. PerformanceID directly gives the other attributes.
- BCNF: PerformanceID is a superkey, and all other attributes are directly dependent on it.
- 4NF: There are no multivalued dependencies. So the table is in 4NF.

Employee

- 1NF: Every attribute in the table is unique, and none of the cells contain multivalued values.
- 2NF: EmployeeID is the only candidate key. All attributes depend on this.
- 3NF: There are no transitive dependencies. All other attributes directly depend on the EmployeeID.
- BCNF: EmployeeID is a superkey. All other attributes directly depend on the superkey.
- 4NF: There are no multivalued dependencies. So the table is in 4NF.

Role

- 1NF: Every attribute in the table is unique, and none of the cells contain multivalued values.
- 2NF: Also here RoleID is the only candidate key. The other two attributes depend on this.
- 3NF: No transitive dependencies. All other attributes directly depend on the RoleID.
- BCNF: RoleID is a super key. All other attributes directly depend on the superkey.
- 4NF: There are no multivalued dependencies. So the table is in 4NF.

Actor

- 1NF: Every attribute in the table is unique, and none of the cells contain multivalued values.
- 2NF: There are only two attributes here. ActorID gives the name, but the name alone cannot give the ActorID.
- 3NF: Only two attributes, so no transitive dependencies.
- BCNF: ActorID is a superkey.
- 4NF: There are no multivalued dependencies. So the table is in 4NF.

Seat

- 1NF: Every attribute in the table is unique, and none of the cells contain multivalued values.
- 2NF: In this table the candidate key is all the attributes together. And we know that this means that all attributes are dependent on themself. Therefore the table is in 2NF.
- 3NF: All attributes are directly dependent on the candidate key.
- BCNF: The candidate key is a superkey.
- 4NF: There are no multivalued dependencies.

Ticket

- 1NF: Every attribute in the table is unique, and none of the cells contain multivalued values.
- 2NF: TicketID identifies all the other attributes and is the only candidate key.
- 3NF: TicketID directly identifies all the other attributes. There is no transitivity.
- BCNF: TicketID is a superkey.
- 4NF: There are no multivalued dependencies.

CustomerProfile

- 1NF: Every attribute in the table is unique, and none of the cells contain multivalued values.
- 2NF: PhoneNumber is unique and the only candidate key in the table. This identifies all the other attributes in the table.
- 3NF: PhoneNumber directly gives all the other attributes, so there is no transitivity.
- PhoneNUmber is a superkey.
- 4NF: There are no multivalued dependencies. So the table is in 4NF.

Task

- 1NF: Every attribute in the table is unique, and none of the cells contain multivalued values.
- 2NF: There are only two attributes here. TaskID gives the description, but the description alone cannot give the ID.
- 3NF: Only two attributes, so no transitive dependencies.
- BCNF: TaskID is a superkey.
- 4NF: There are no multivalued dependencies. So the table is in 4NF.

Act

- 1NF: Every attribute in the table is unique, and none of the cells contain multivalued values.
- 2NF: Here PlayID and number together is the primary key and this key gives the name of the act. This is the only candidate key and it identifies all the attributes in the table.
- 3NF: There are no transitive dependencies.
- BCNF: The candidate key is a superkey so it's on BCNF.
- 4NF: There are no multivalued dependencies. So the table is in 4NF.

RoleInAct

- 1NF: Every attribute in the table is unique, and none of the cells contain multivalued values.
- 2NF: In this table the candidate key is the combination of RoleID, Number and PlayID. This is the whole table, which means that all attributes depend on the candidate key.
- 3NF: All attributes are directly dependent on the candidate key. No transitivity.
- BCNF: The candidate key is a superkey.
- 4NF: There are no multivalued dependencies.

PlaysInRole

- 1NF: Every attribute in the table is unique, and none of the cells contain multivalued values.
- 2NF: In this table the candidate key is the combination of ActorID and RoleID. This is the whole table, which means that all attributes depend on the candidate key.
- 3NF: All attributes are directly dependent on the candidate key. No transitivity.
- BCNF: The candidate key is a superkey.
- 4NF: There are no multivalued dependencies.

Execute

- 1NF: Every attribute in the table is unique, and none of the cells contain multivalued values.
- 2NF: In this table the candidate key is the combination of TaskID and EmployeeID. This is the whole table, which means that all attributes depend on the candidate key.
- 3NF: All attributes are directly dependent on the candidate key. No transitivity.
- BCNF: The candidate key is a superkey.
- 4NF: There are no multivalued dependencies.

c) Restrictions handled in the software

We have chosen to make it such that a hall can have multiple plays, but not in the same season (As specified in the project description). To make sure that this is the case, we must implement validation in the software to check that there is only one play in a season per hall.