Design of databases

Example of relational logic design

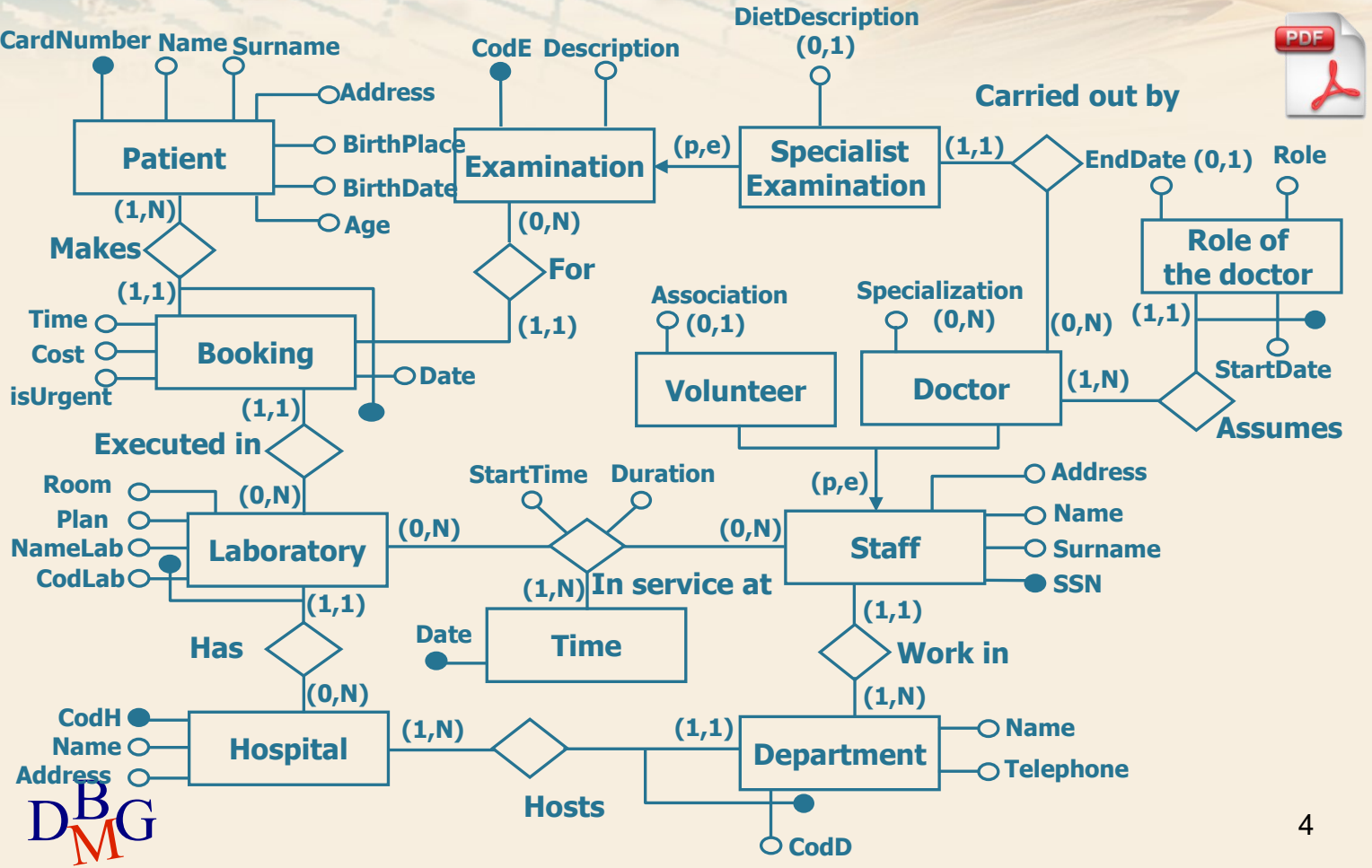
Example of relational logic design

- Introduction
- ER scheme restructuration
- Translation of the entities with an external identifier
- Translation of the entities without an external identifier
- Translation of the relationships

Example of relational logic design

Introduction

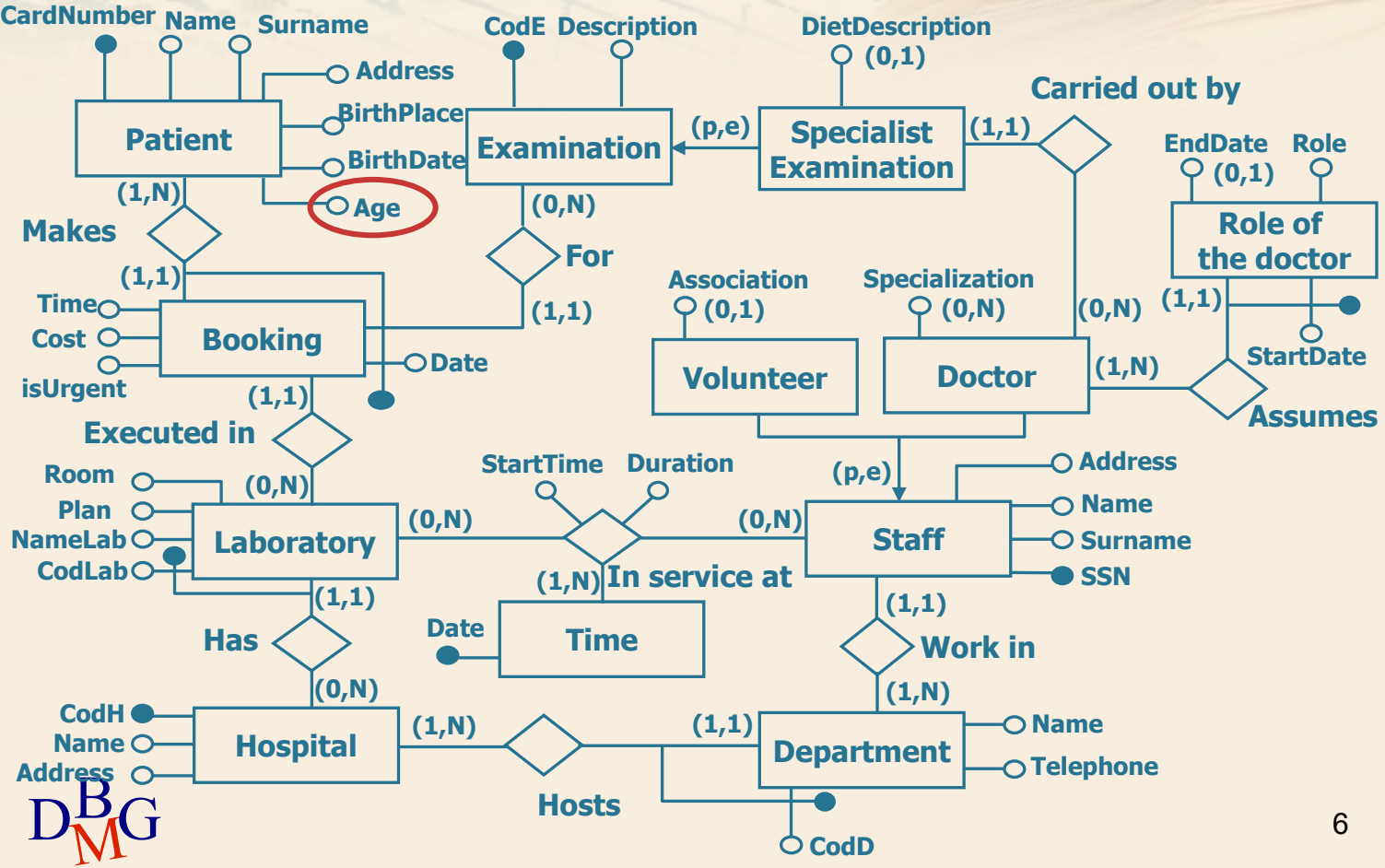
Starting conceptual model



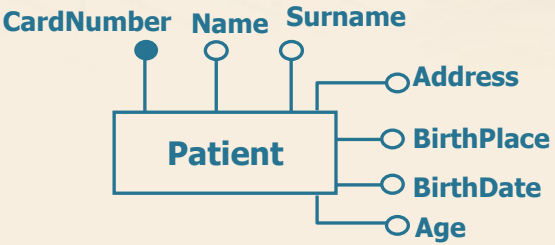
Example of relational logic design

ER scheme restructuration

Analysis of the derived attributes

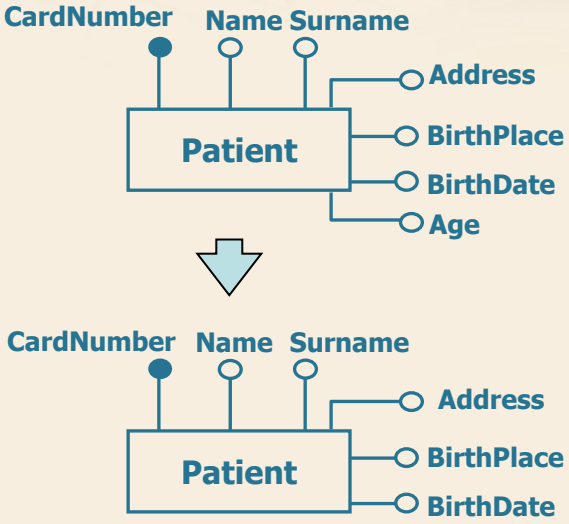


Derived Age attribute

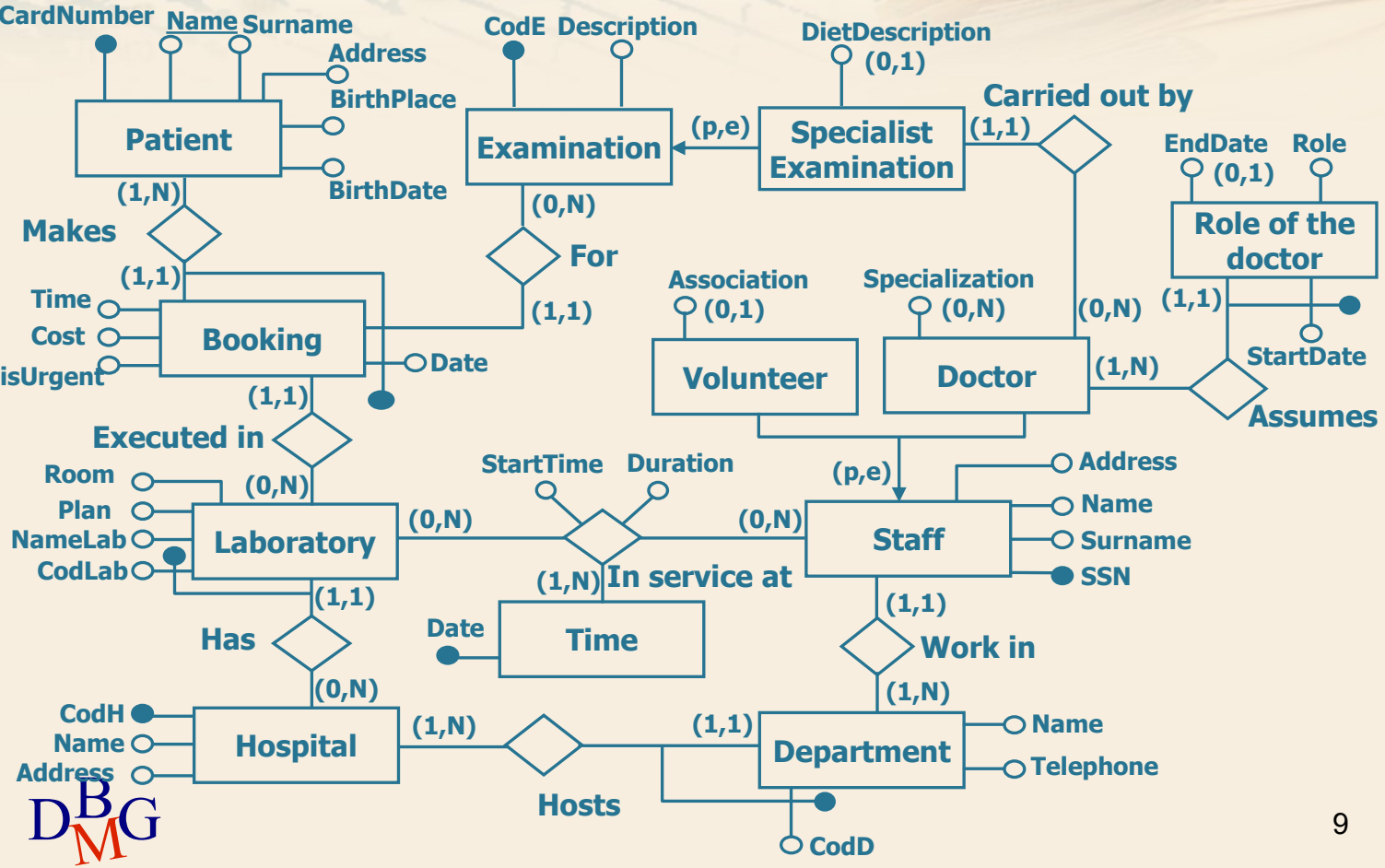


- The Age attribute can be removed since
  - It can be easily calculated from the date of birth (BirthDate)
  - It is not generally present in a query

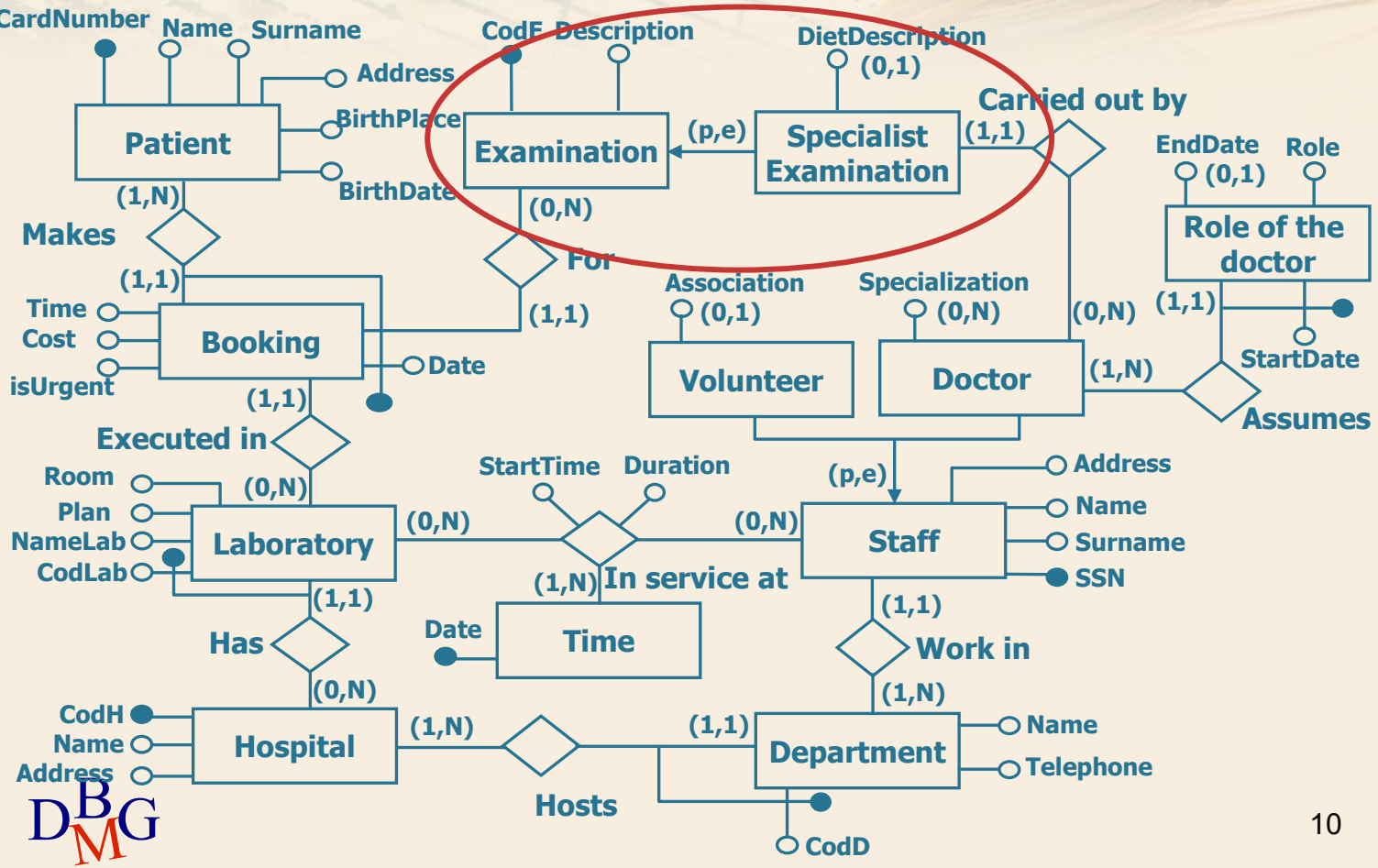
Elimination of the Age attribute



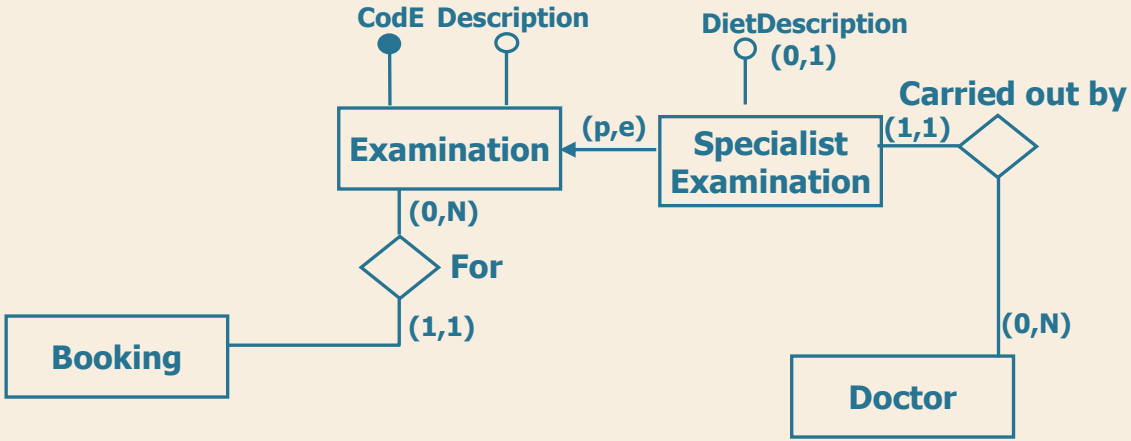
Simplified scheme (n. 1)



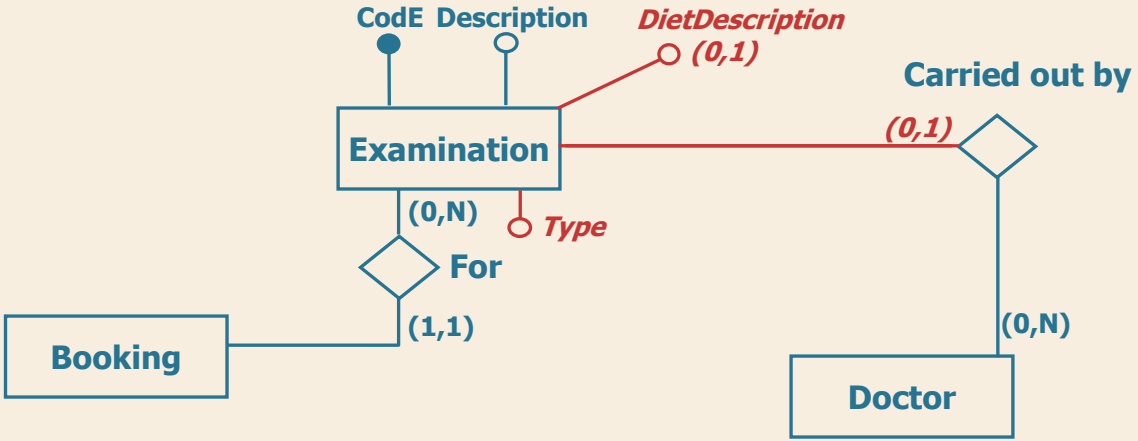
Elimination of the hierarchies



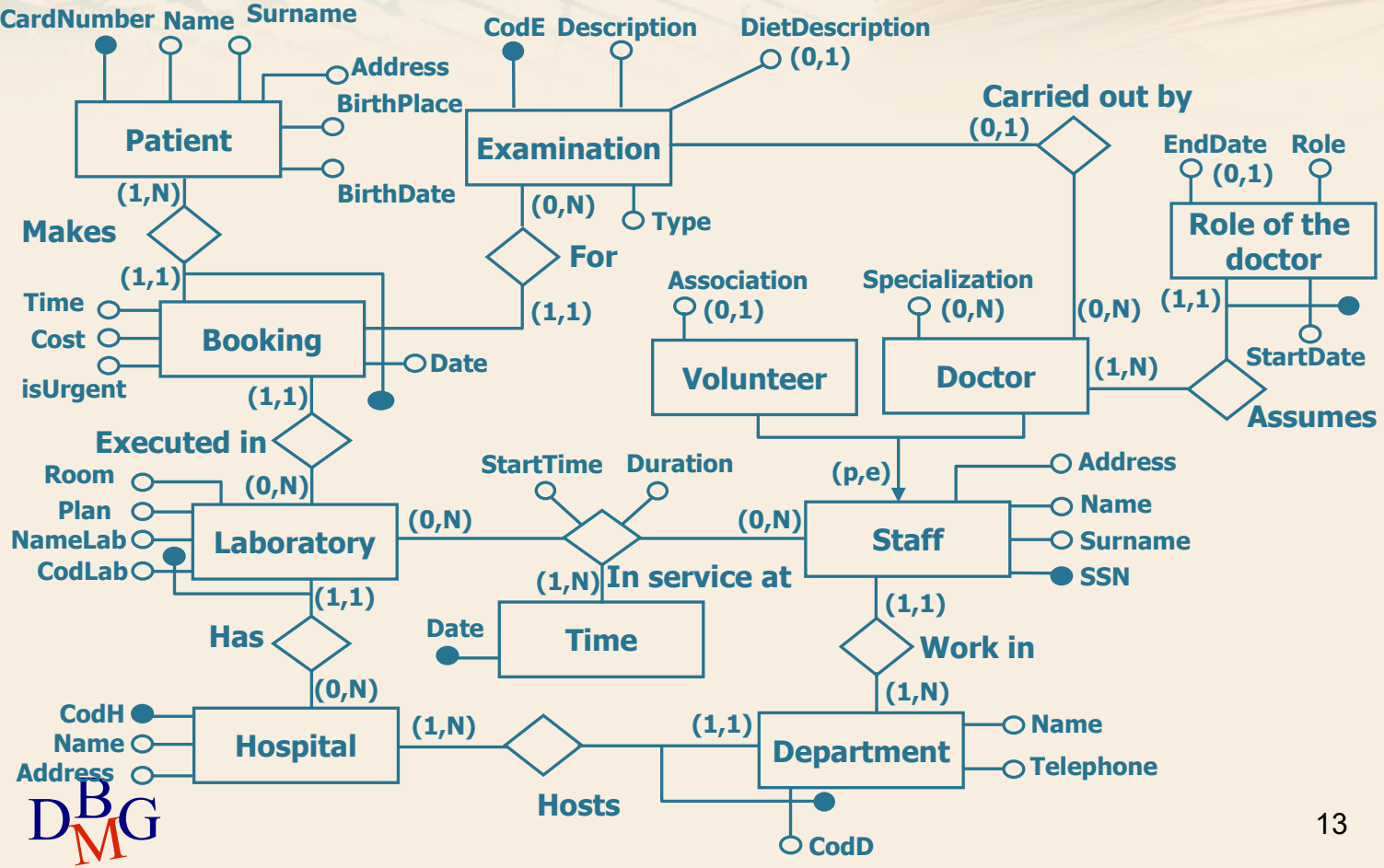
Examination of the hierarchies



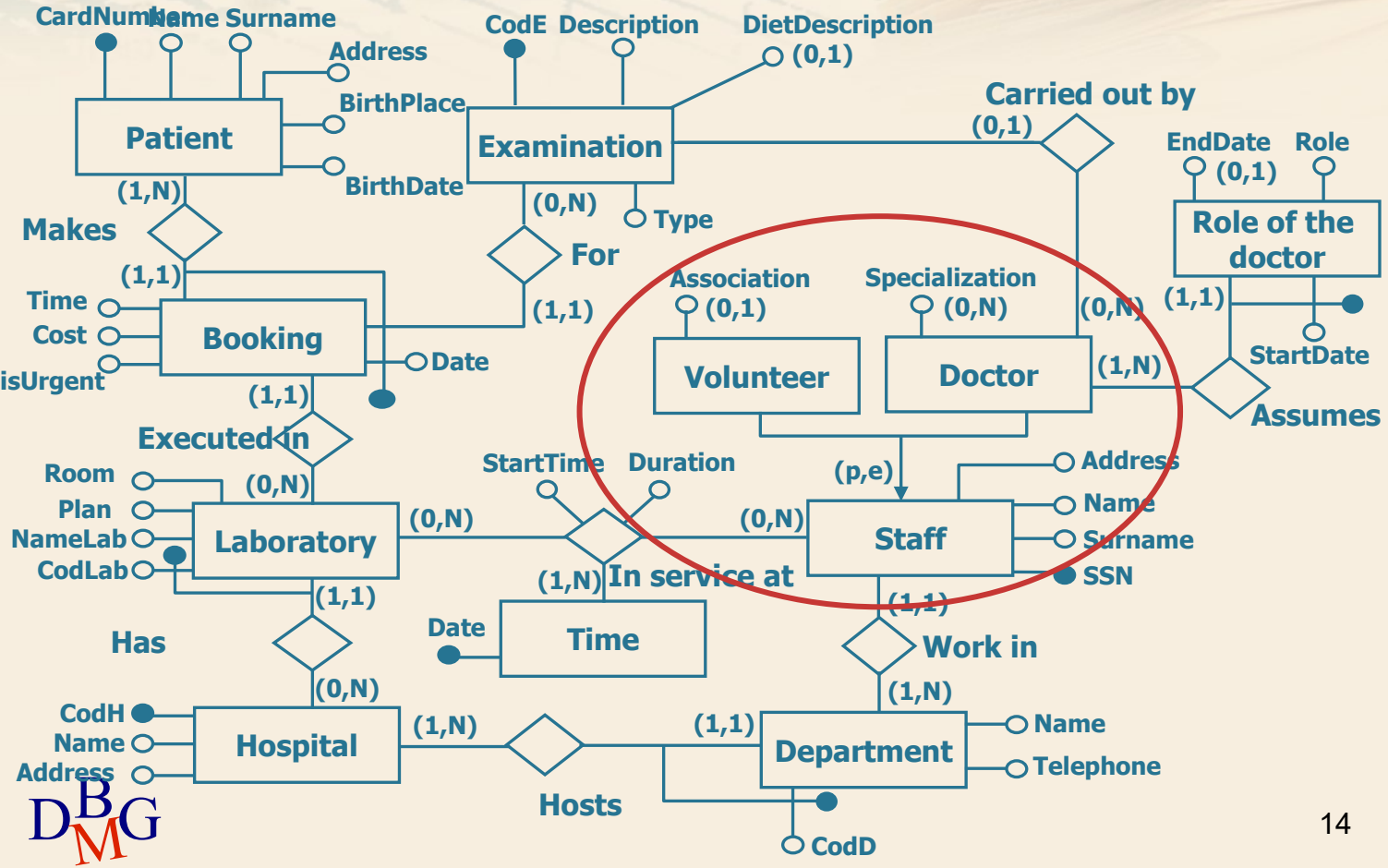
Merge into the parent entity



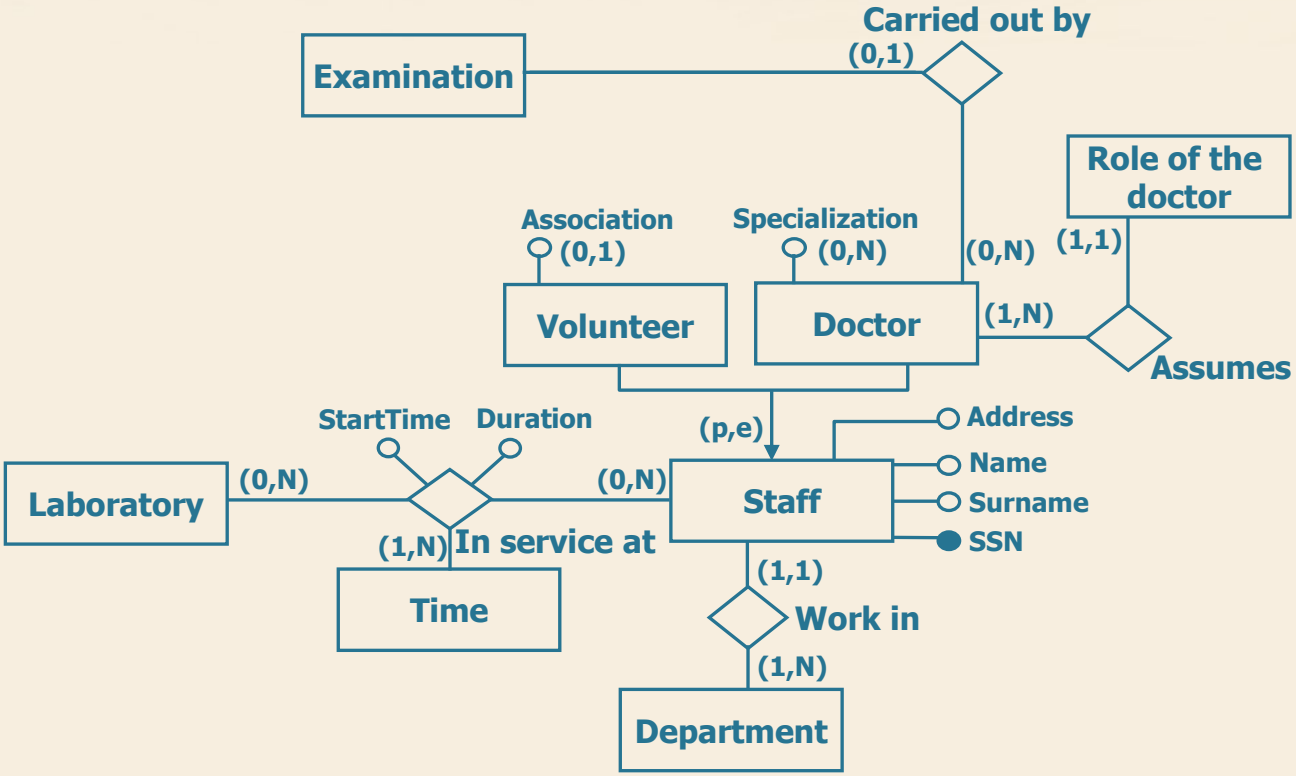
Simplified scheme (n. 2)



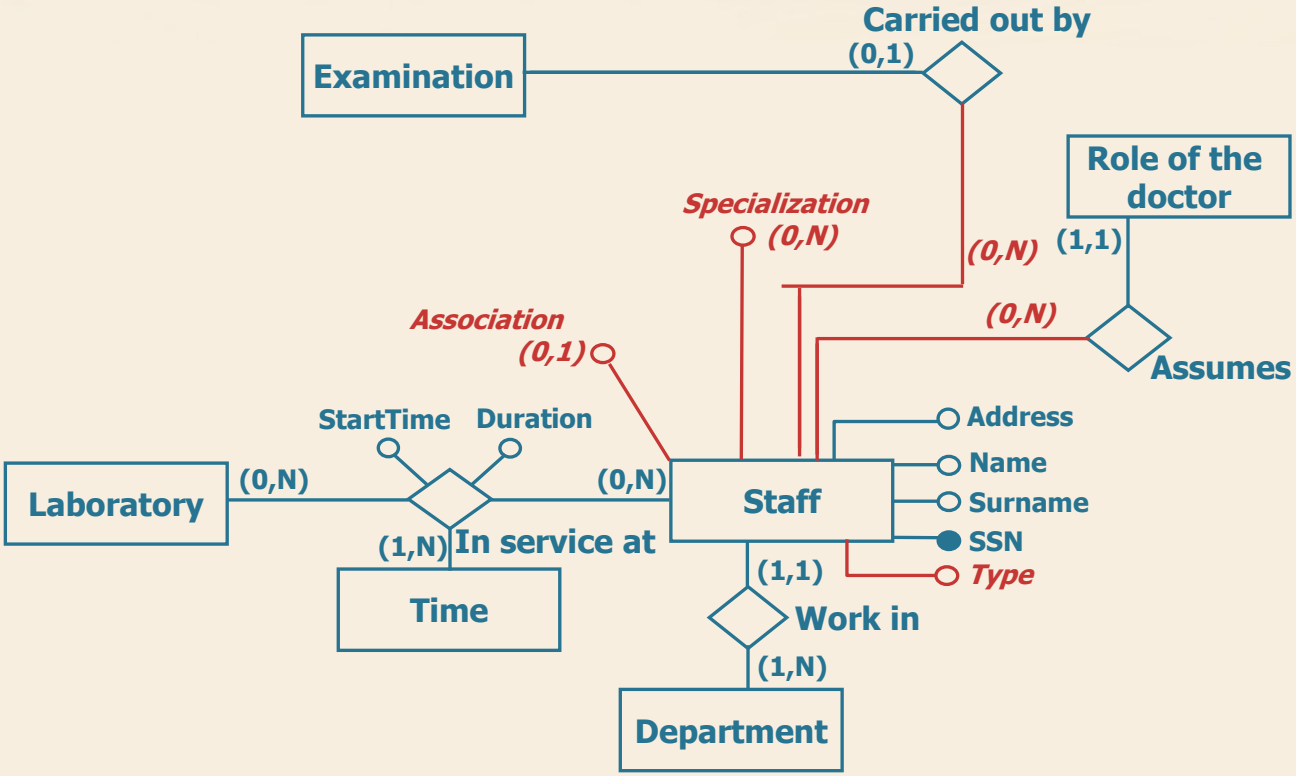
Elimination of the hierarchies



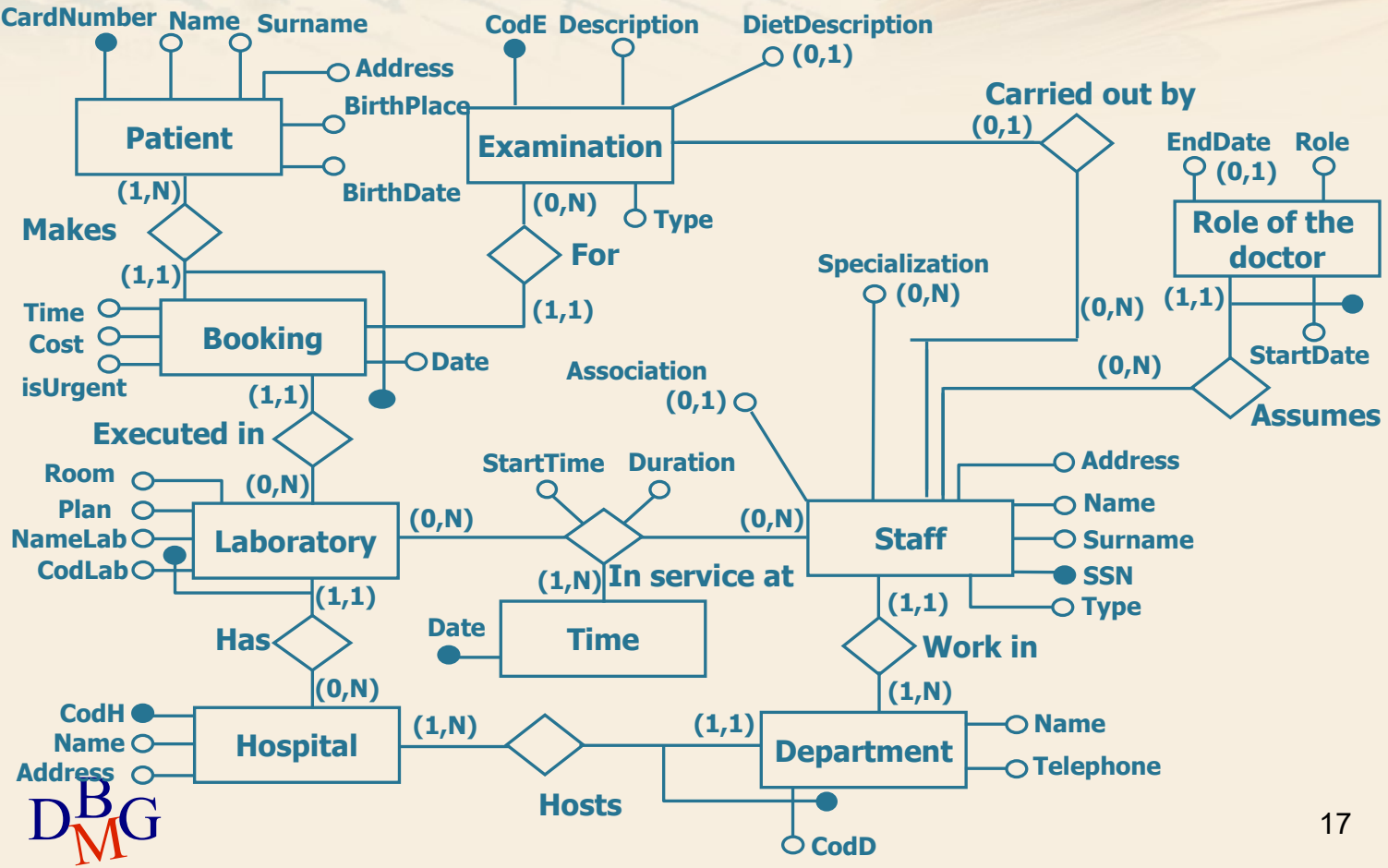
Staff hierarchies



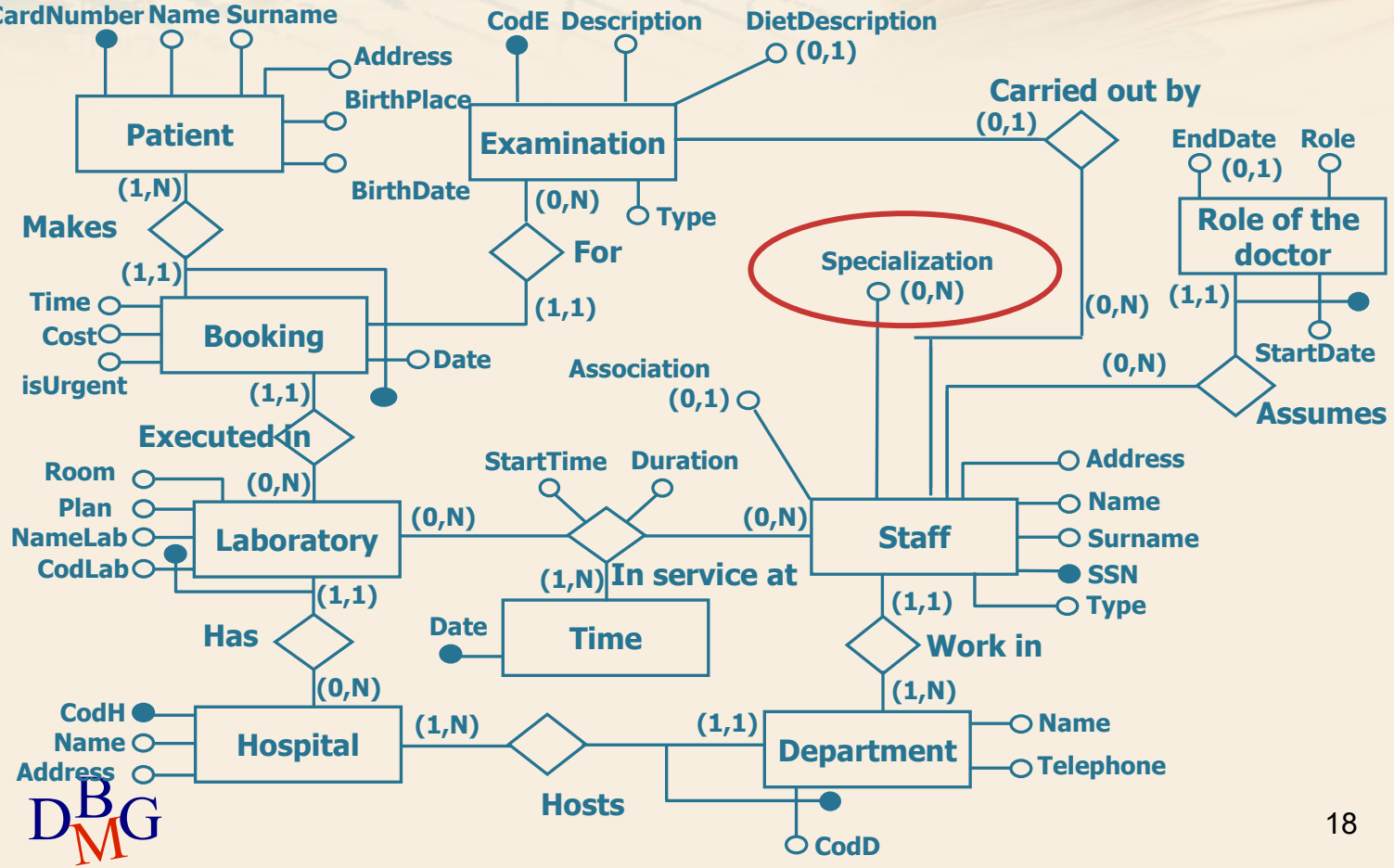
Merge into the parent entity



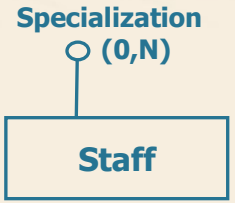
Simplified scheme (n. 3)



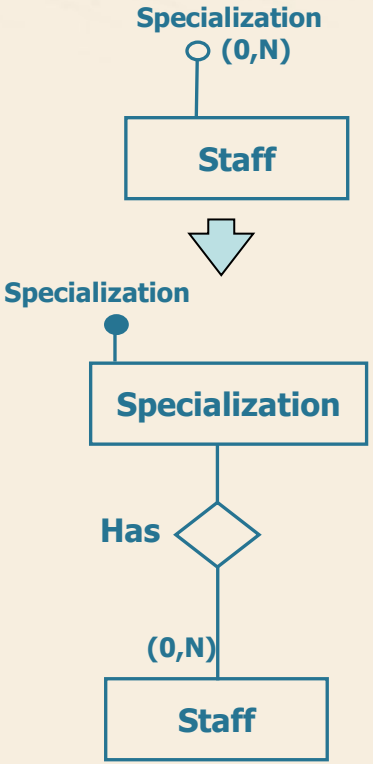
Elimination of the multivalued attributes



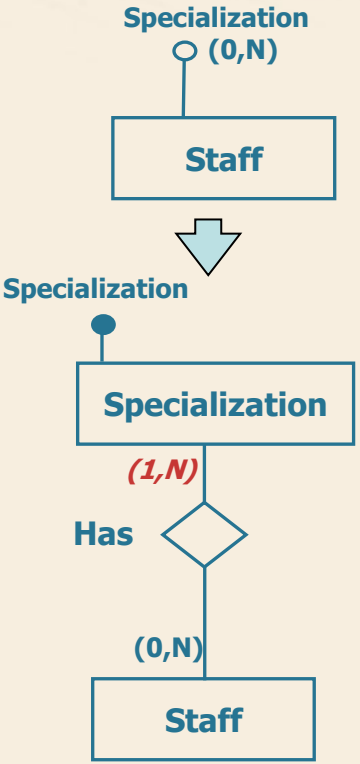
Multivalued Spacialization attribute



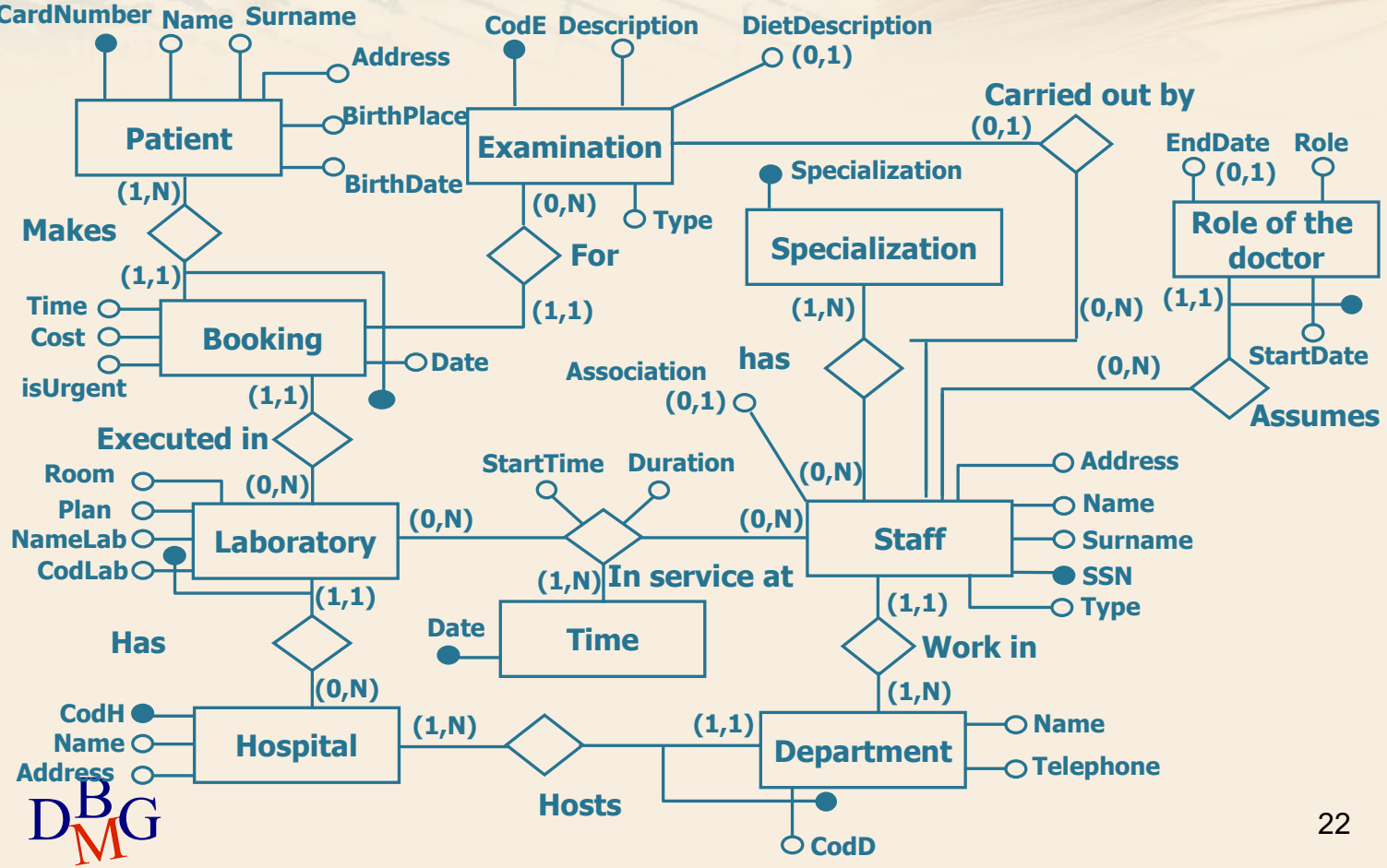
Introduction of the Specialization entity



Cardinality of the Hosts relationship



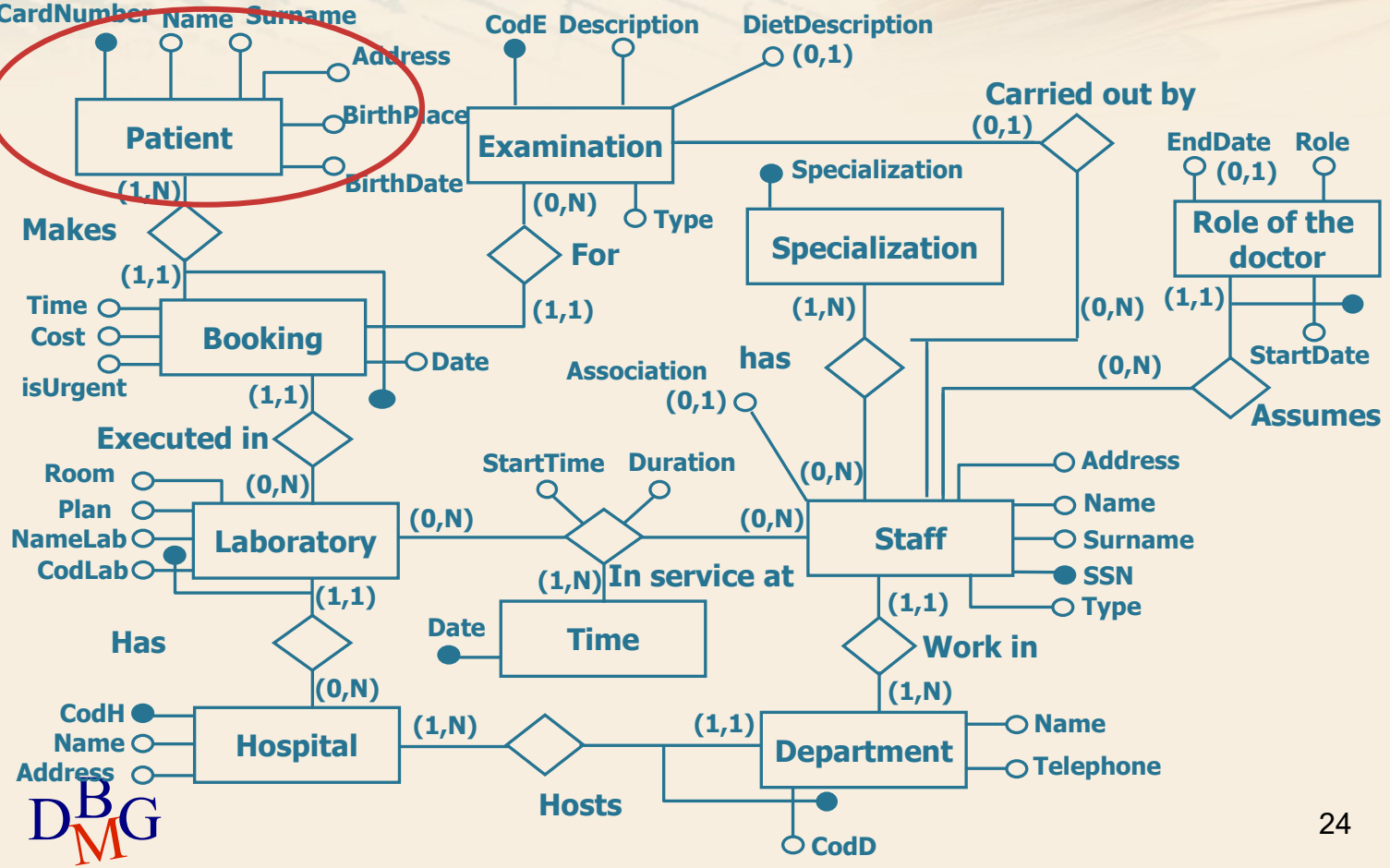
Final restructured ER scheme



Example of relational logic design

Translation of the entities without an external identifier

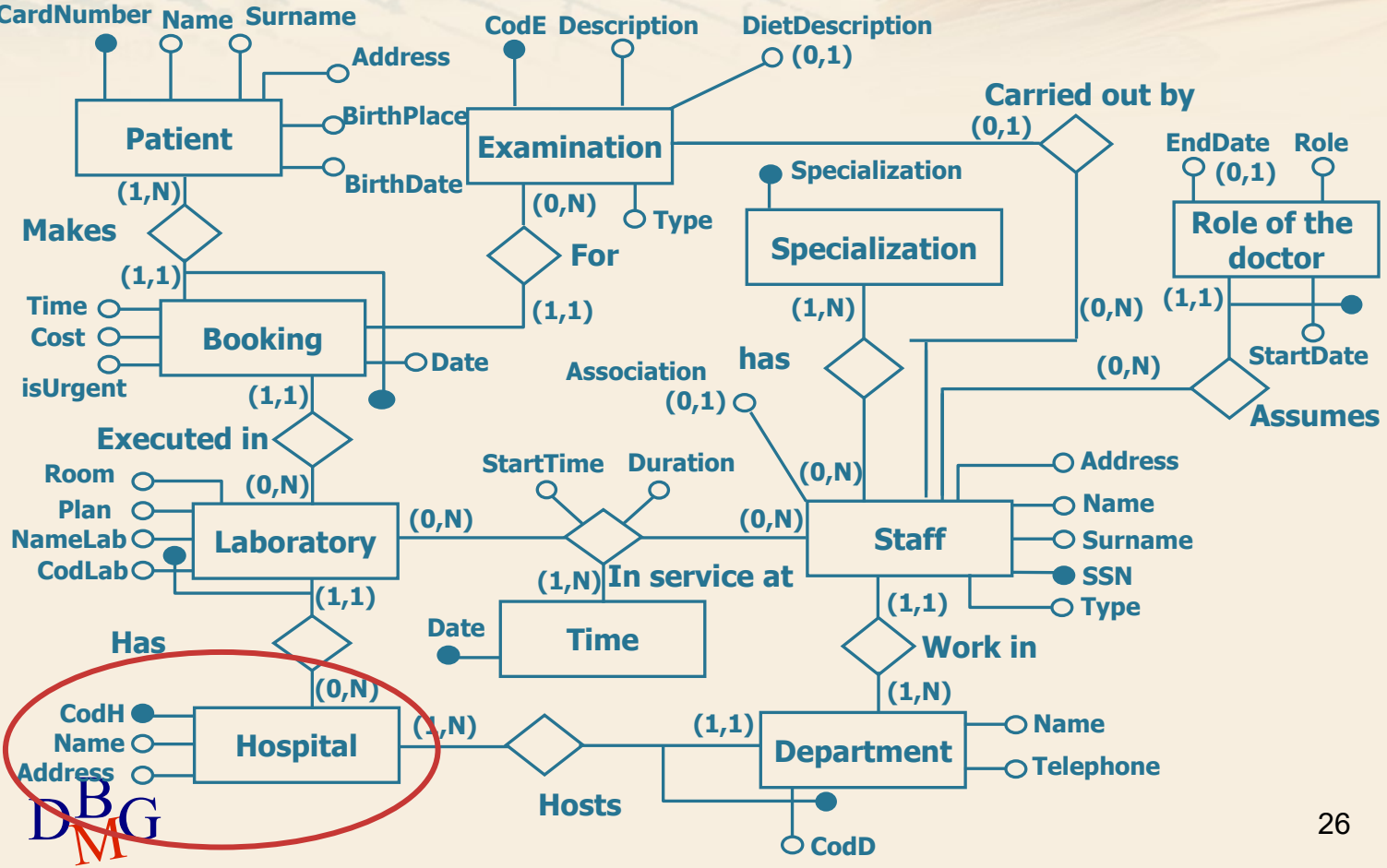
Translation of the Patient entity



Translation of the Patient Entity

Patient(CardNumber, Name, Surname, Address, BirthPlace, BirthDate)

Translation of the Hospital entity

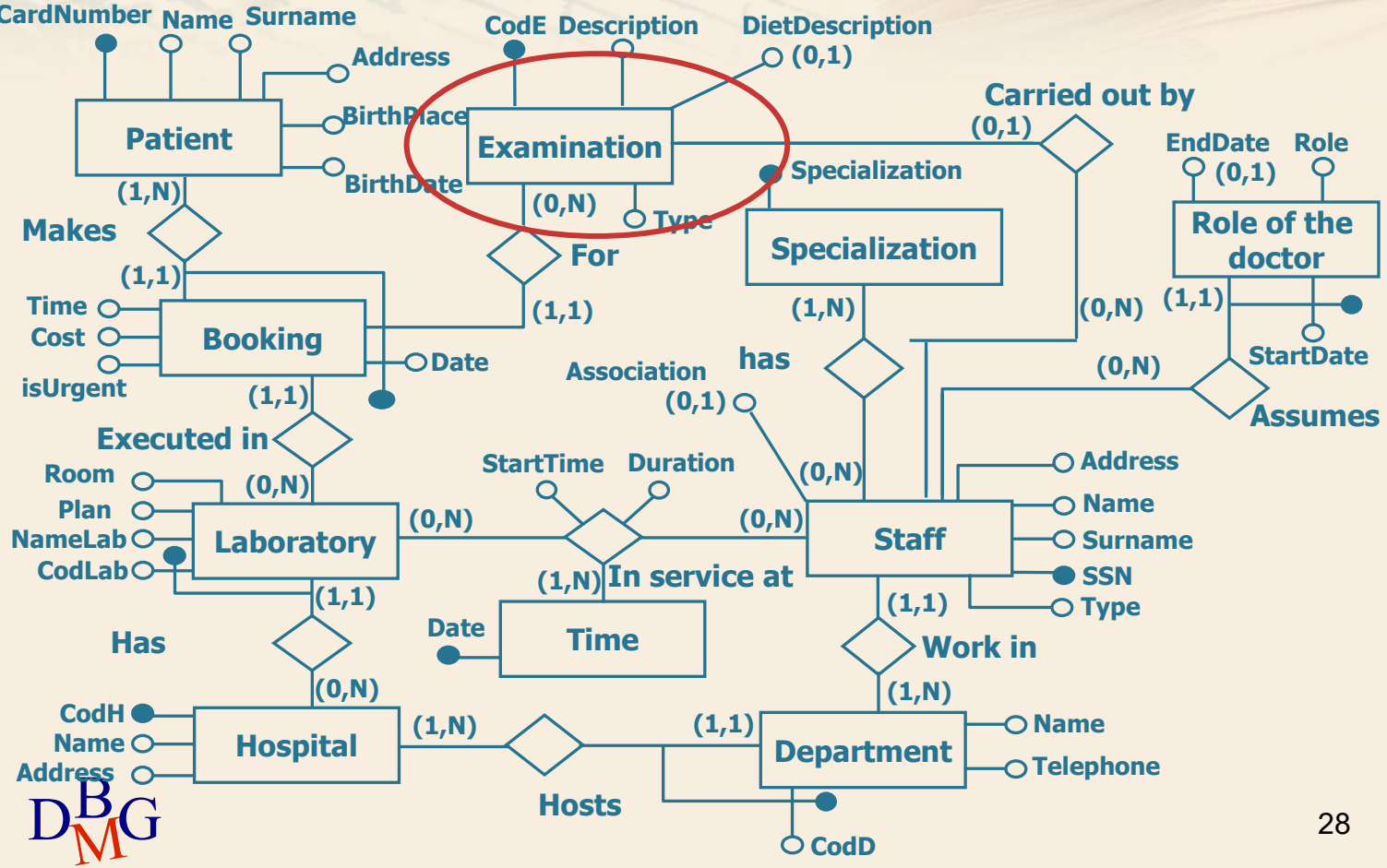


Translation of the Hospital Entity

Patient(CardNumber, Name, Surname, Address, BirthPlace, BirthDate)

Hospital(CodH, Name, Address)

Translation of the Examination entity



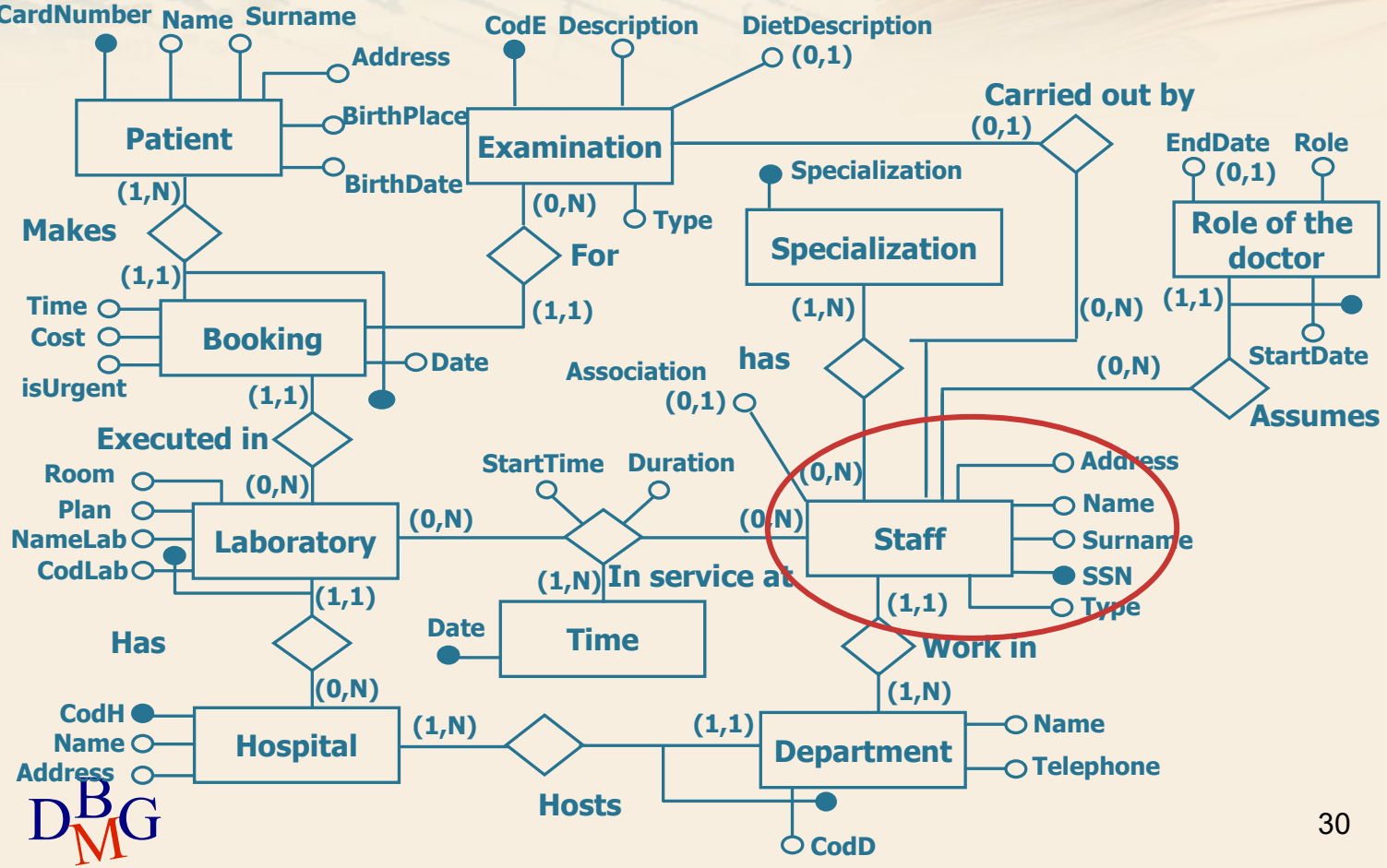
Translation of the Examination entity

Patient(CardNumber, Name, Surname, Address, BirthPlace, BirthDate)

Hospital(CodH, Name, Address)

Examination(CodE, Description, DietDescription, Type)*

Translation of the Staff entity



Translation of the Staff entity

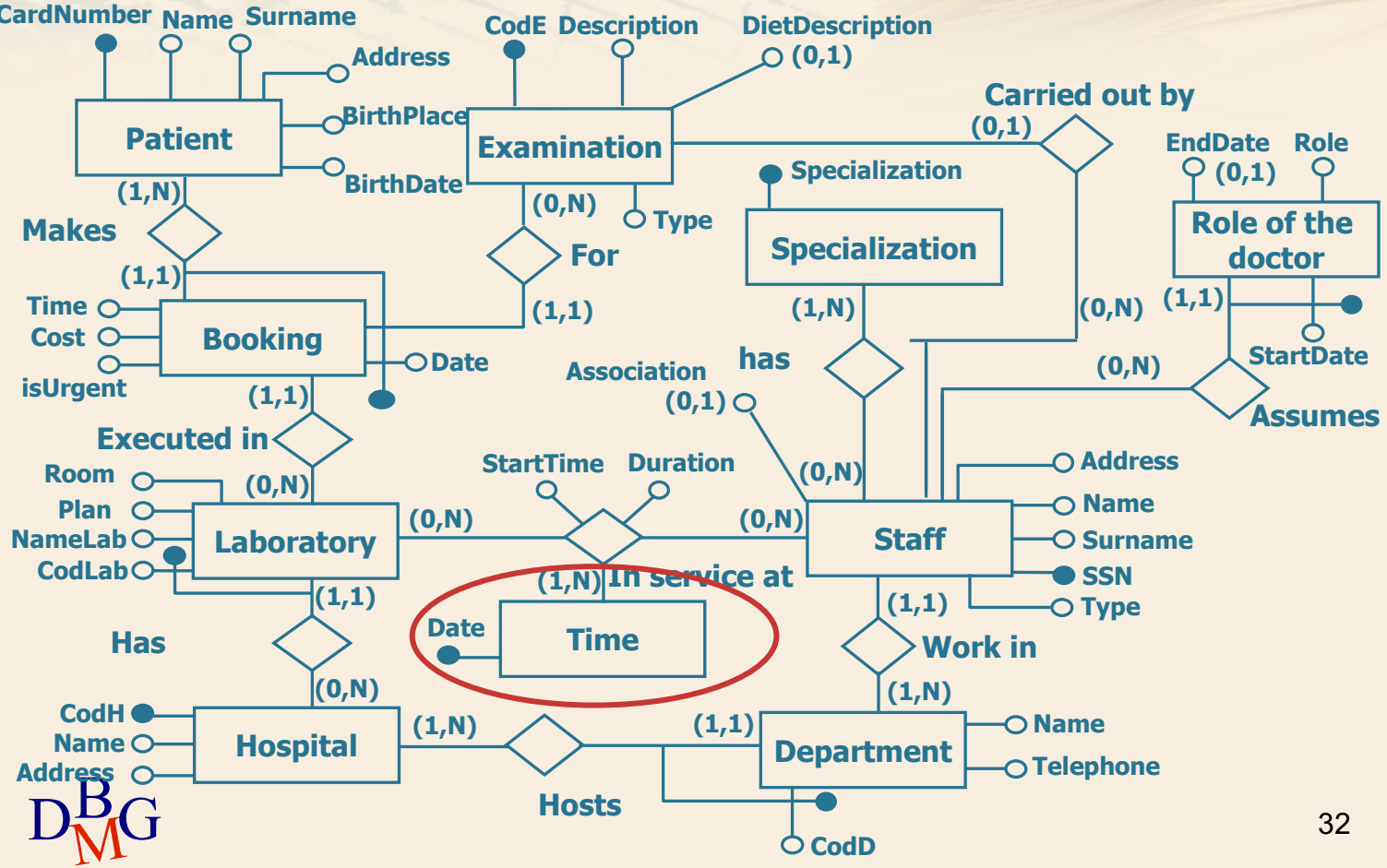
Patient(CardNumber, Name, Surname, Address, BirthPlace, BirthDate)

Hospital(CodH, Name, Address)

Examination(CodE, Description, DietDescription*, Type)

Staff(SSN, Name, Surname, Address, Association,Type)*

Translation of the Time entity



Translation of the Time entity

Patient(CardNumber, Name, Surname, Address, BirthPlace, BirthDate)

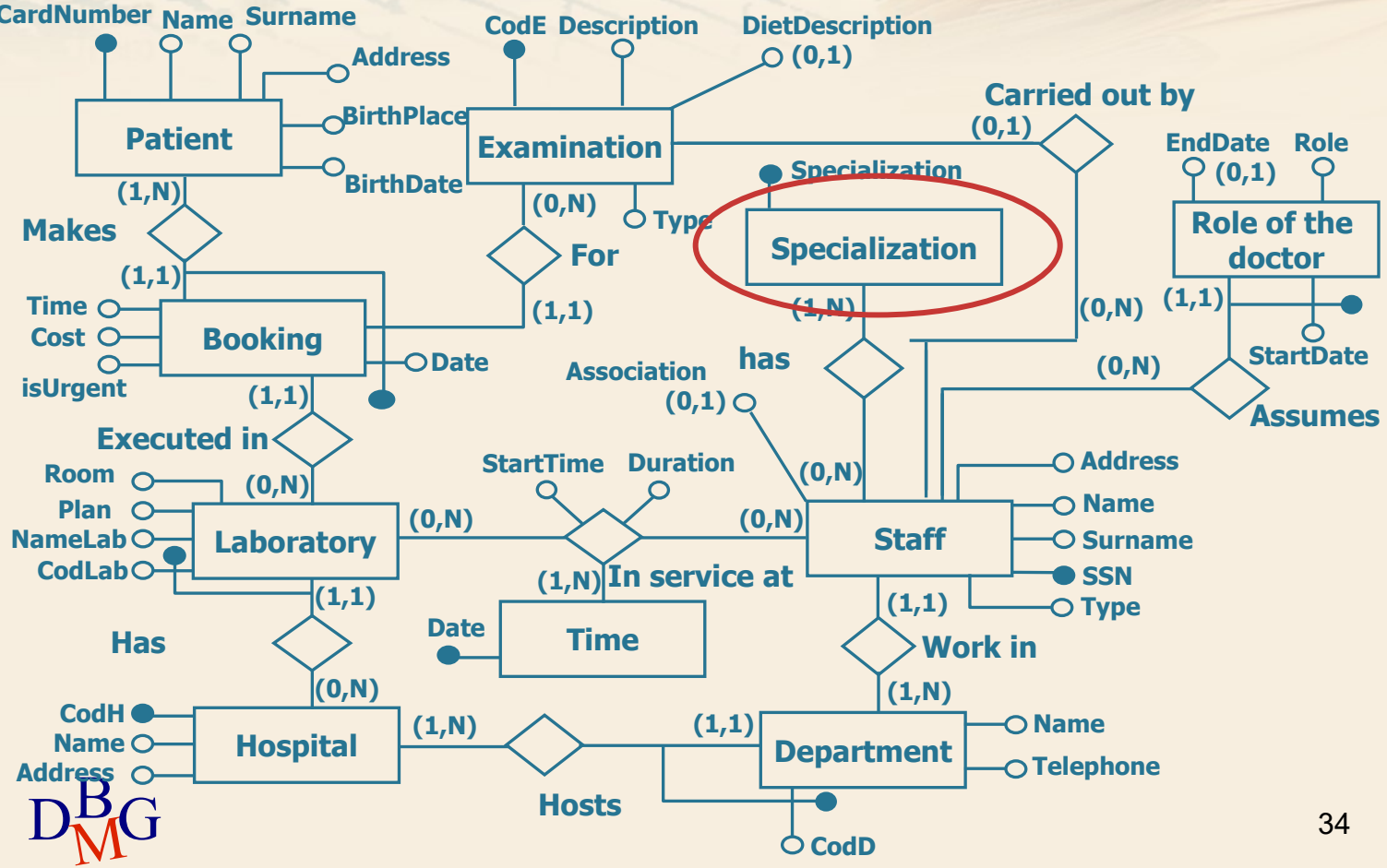
Hospital(CodH, Name, Address)

Examination(CodE, Description, DietDescription*, Type)

Staff(SSN, Name, Surname, Address, Association*,Type)

Time(Date)

Translation of the Specialization entity



Translation of the Specialization entity

Patient(CardNumber, Name, Surname, Address, BirthPlace, BirthDate)

Hospital(CodH, Name, Address)

Examination(CodE, Description, DietDescription*, Type)

Staff(SSN, Name, Surname, Address, Association*,Type)

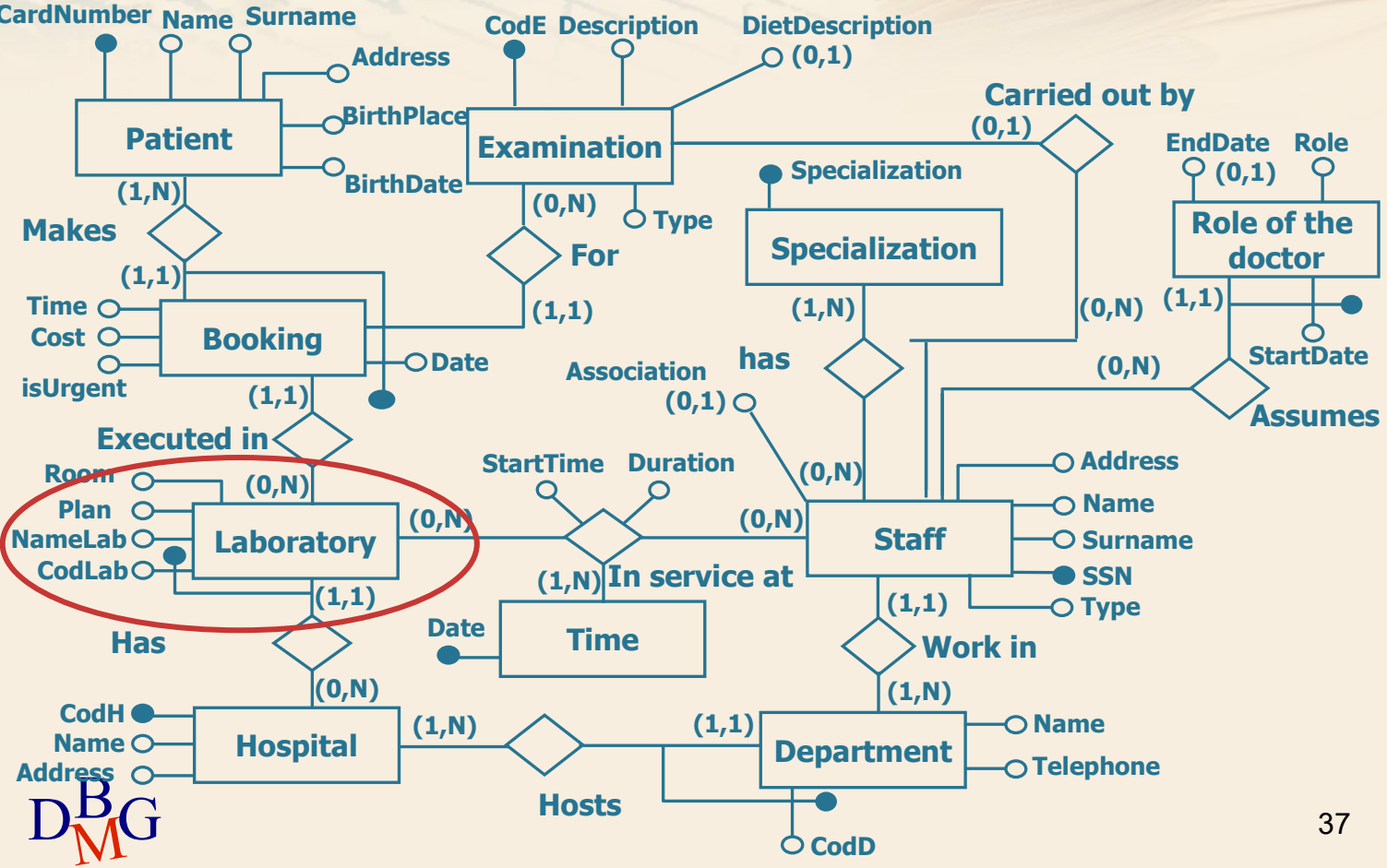
Time(Date)

Specialization(Specialization)

Example of relational logic design

Translation of the entities with an external identifier

Translation of the Laboratory entity



Translation of the Laboratory entity

Patient(CardNumber, Name, Surname, Address, BirthPlace, BirthDate)

Hospital(CodH, Name, Address)

Examination(CodE, Description, DietDescription*, Type)

Staff(SSN, Name, Surname, Address, Association*,Type)

Time(Date)

Specialization(Specialization)

Laboratory(CodLab, CodH,

Translation of the Laboratory entity

Patient(CardNumber, Name, Surname, Address, BirthPlace, BirthDate)

Hospital(CodH, Name, Address)

Examination(CodE, Description, DietDescription*, Type)

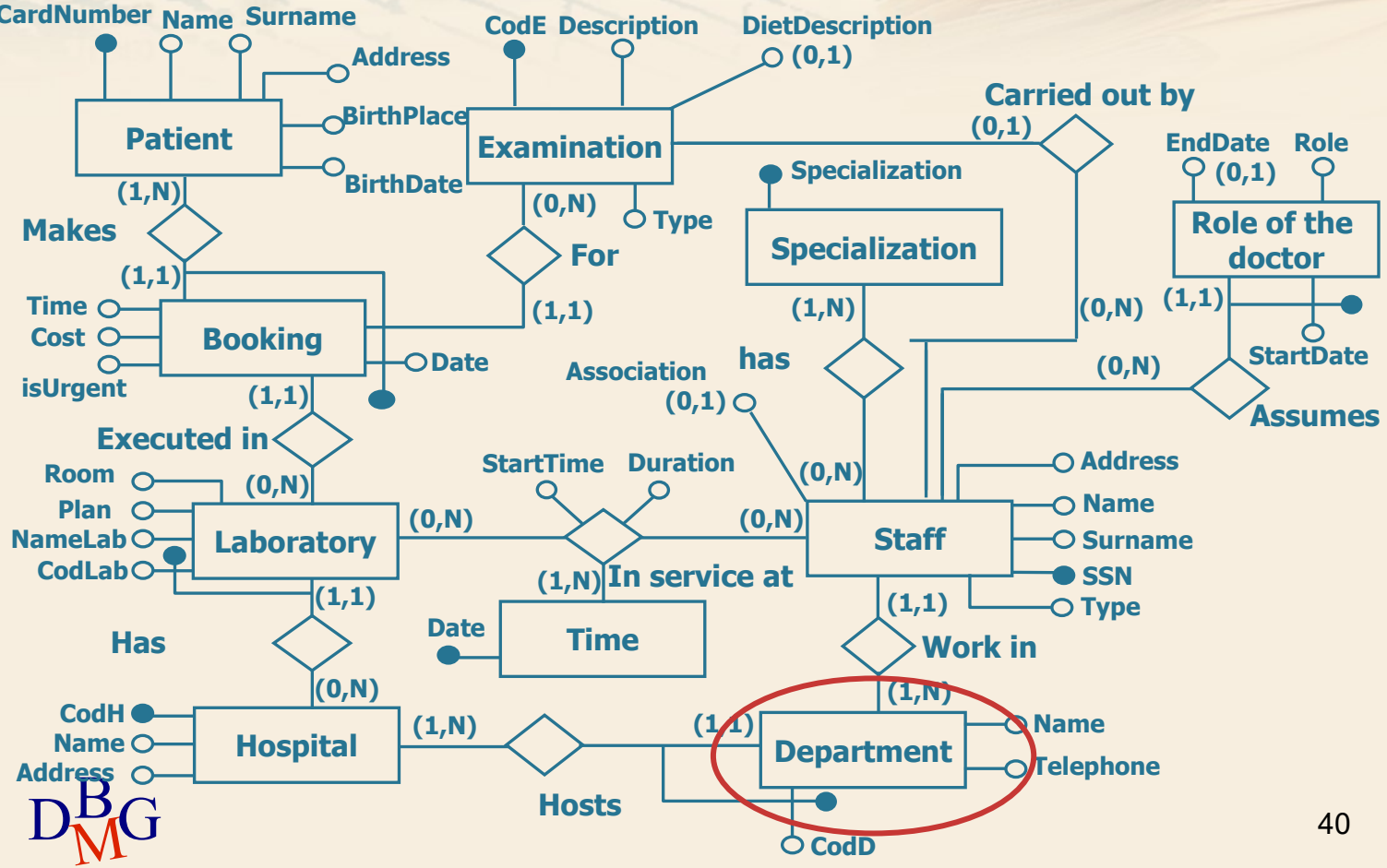
Staff(SSN, Name, Surname, Address, Association*,Type)

Time(Date)

Specialization(Specialization)

Laboratory(CodLab, CodH, NameLab, Plan, Room)

Translation of the Department entity



Translation of the Department entity

Patient(CardNumber, Name, Surname, Address, BirthPlace, BirthDate)

Hospital(CodH, Name, Address)

Examination(CodE, Description, DietDescription*, Type)

Staff(SSN, Name, Surname, Address, Association*,Type)

Time(Date)

Specialization(Specialization)

Laboratory(CodLab, CodH, NameLab, Plan, Room)

Department(CodD, CodH,

Translation of the Department entity

Patient(CardNumber, Name, Surname, Address, BirthPlace, BirthDate)

Hospital(CodH, Name, Address)

Examination(CodE, Description, DietDescription*, Type)

Staff(SSN, Name, Surname, Address, Association*,Type)

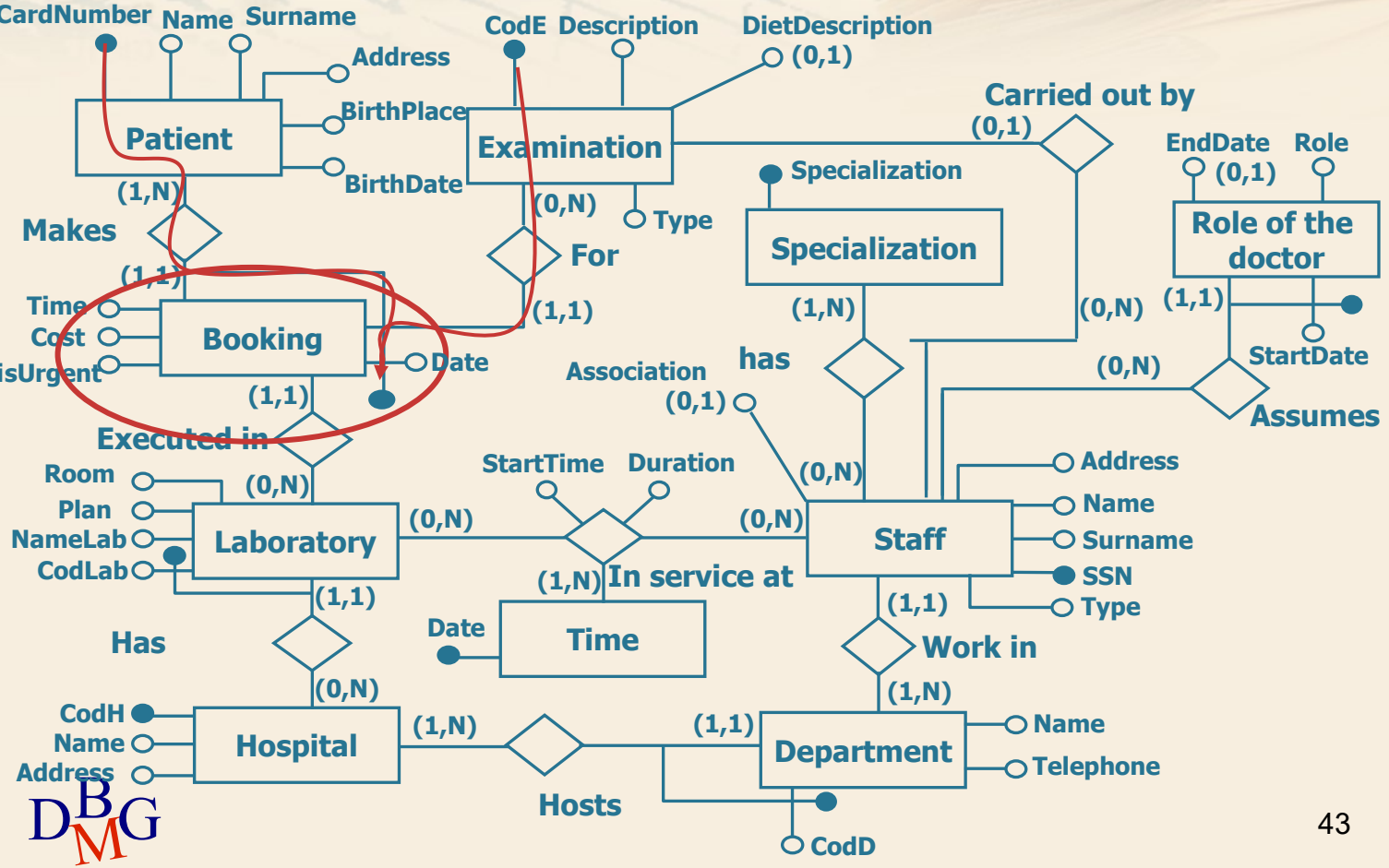
Time(Date)

Specialization(Specialization)

Laboratory(CodLab, CodH, NameLab, Plan, Room)

Department(CodD, CodH, Name, Telephone)

Translation of the Booking entity



Translation of the Booking entity

Patient(CardNumber, Name, Surname, Address, BirthPlace, BirthDate)

Hospital(CodH, Name, Address)

Examination(CodE, Description, DietDescription*, Type)

Staff(SSN, Name, Surname, Address, Association*,Type)

Time(Date)

Specialization(Specialization)

Laboratory(CodLab, CodH, NameLab, Plan, Room)

Department(CodD, CodH, Name, Telephone)

Booking(CardNumber, CodE, Date,

Translation of the Booking entity

Patient(CardNumber, Name, Surname, Address, BirthPlace, BirthDate)

Hospital(CodH, Name, Address)

Examination(CodE, Description, DietDescription*, Type)

Staff(SSN, Name, Surname, Address, Association*,Type)

Time(Date)

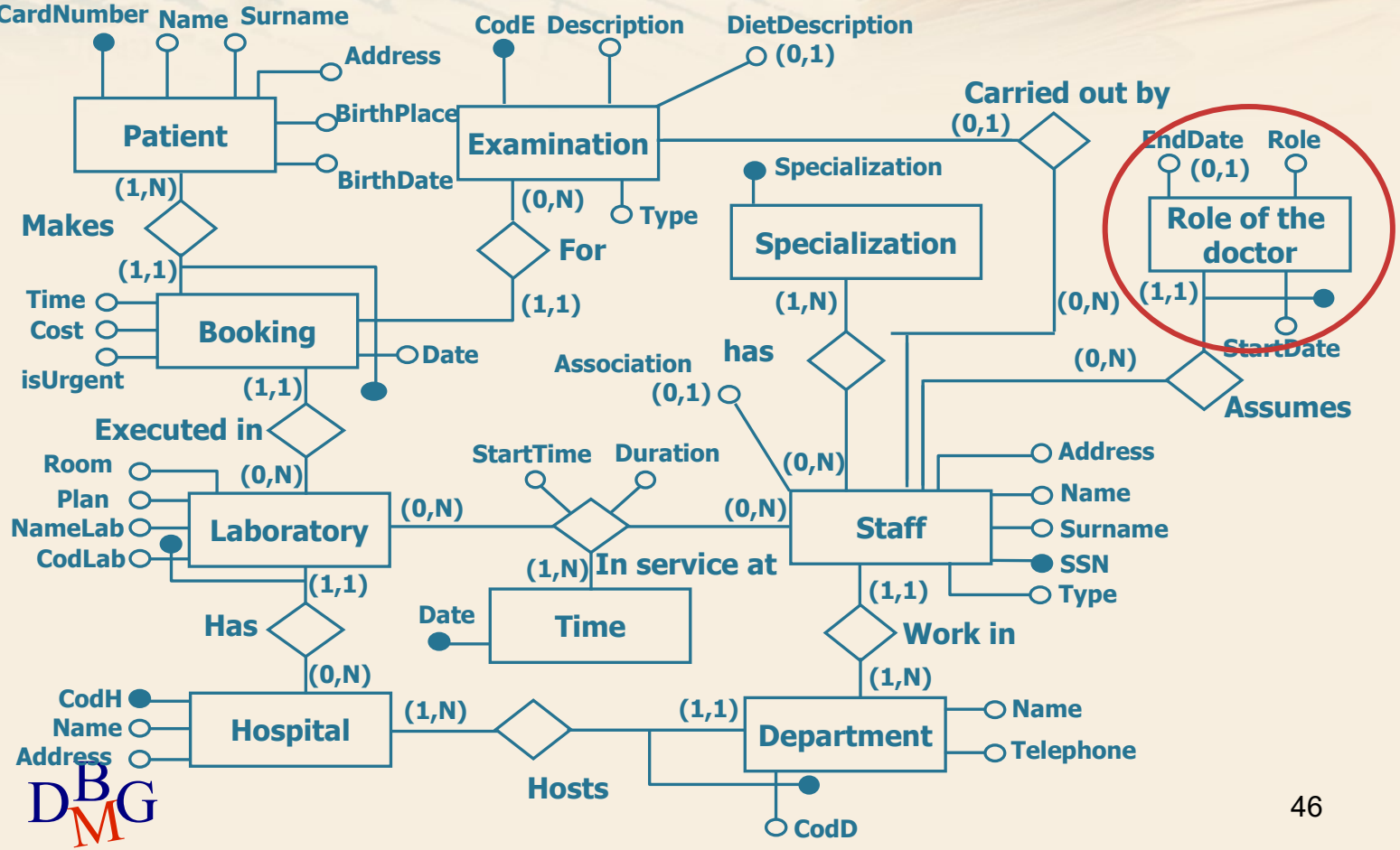
Specialization(Specialization)

Laboratory(CodLab, CodH, NameLab, Plan, Room)

Department(CodD, CodH, Name, Telephone)

Booking(CardNumber, CodE, Date, Time, Cost, isUrgent)

Translation of the Role of the doctor entity



Translation of the Role of the doctor entity

Patient(CardNumber, Name, Surname, Address, BirthPlace, BirthDate)

Hospital(CodH, Name, Address)

Examination(CodE, Description, DietDescription*, Type)

Staff(SSN, Name, Surname, Address, Association*,Type)

Time(Date)

Specialization(Specialization)

Laboratory(CodLab, CodH, NameLab, Plan, Room)

Department(CodD, CodH, Name, Telephone)

Booking(CardNumber, CodE, Date, Time, Cost, isUrgent)

DoctorRole(SSN, StartDate,

Translation of the Role of the doctor entity

Patient(CardNumber, Name, Surname, Address, BirthPlace, BirthDate)

Hospital(CodH, Name, Address)

Examination(CodE, Description, DietDescription*, Type)

Staff(SSN, Name, Surname, Address, Association*,Type)

Time(Date)

Specialization(Specialization)

Laboratory(CodLab, CodH, NameLab, Plan, Room)

Department(CodD, CodH, Name, Telephone)

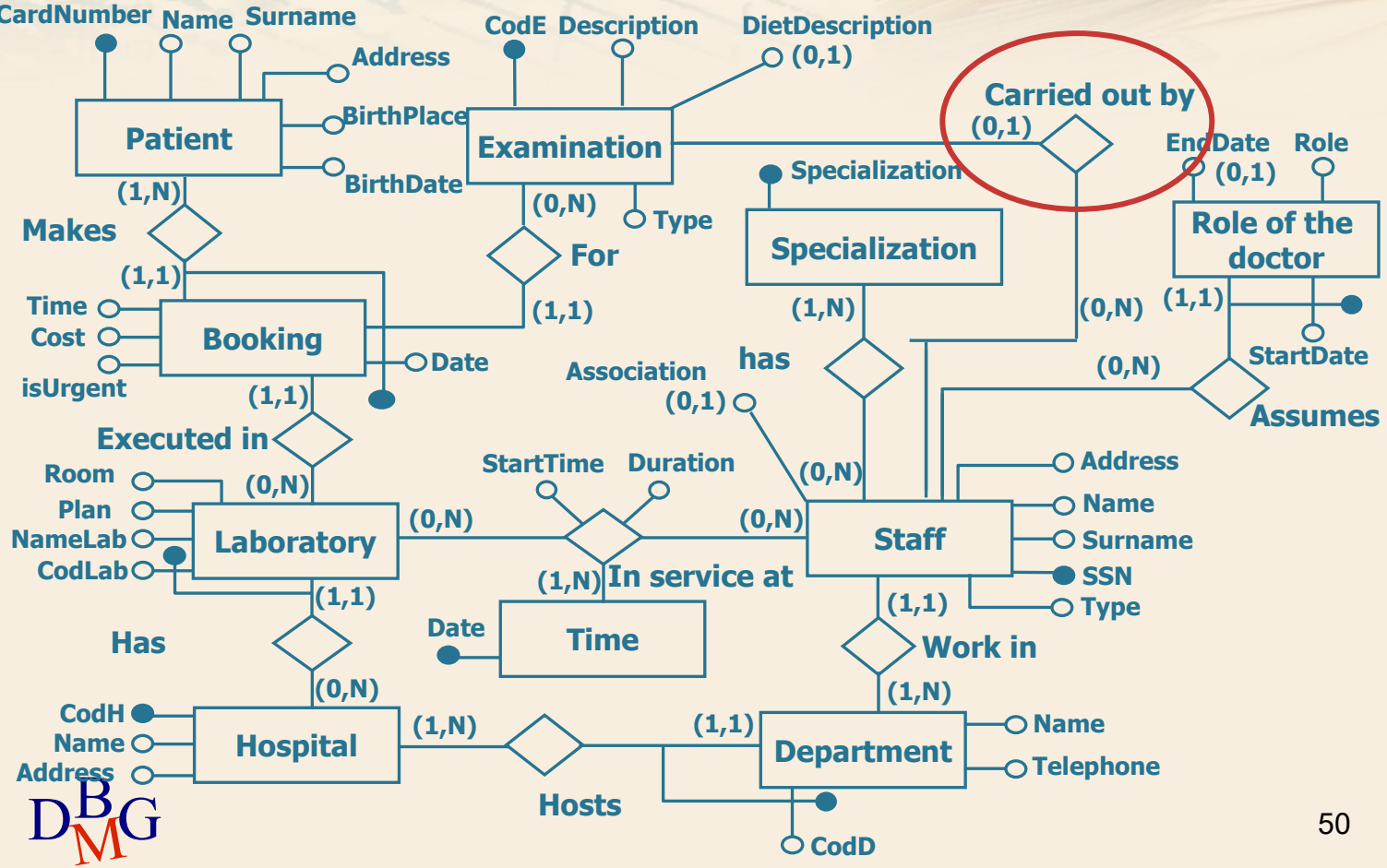
Booking(CardNumber, CodE, Date, Time, Cost, isUrgent)

DoctorRole(SSN, StartDate, EndDate, Role)*

Example of relational logic design

Translation of the relationships

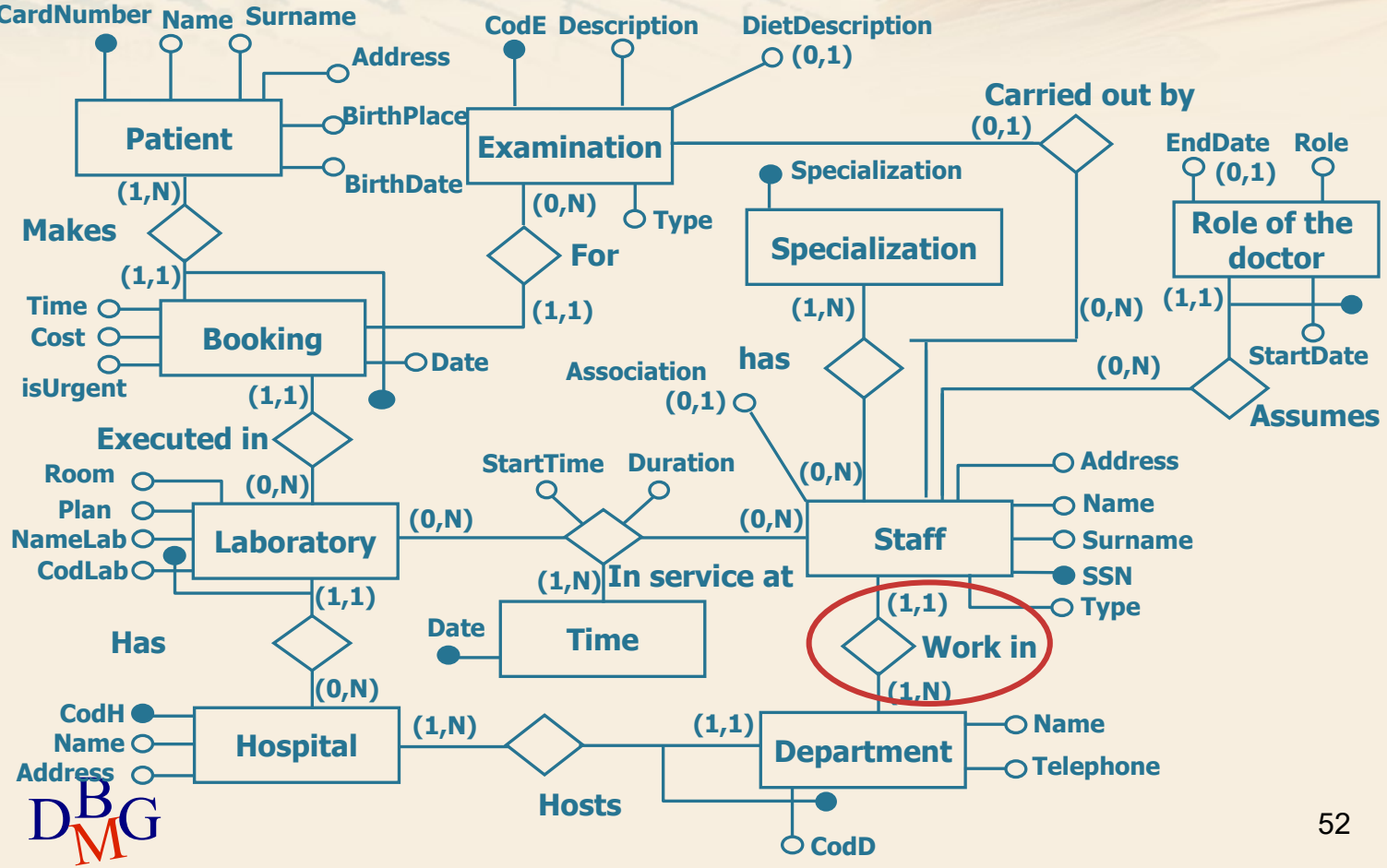
Binary one-to-many Carried out by relationship



Translation of the Carried out by relationship

Patient(CodTes, Name, Surname, Address, BirthPlace, BirthDate)
Hospital(CodH, Name, Address)
Examination(CodE, Description, DietDescription*, Type, *SSN**)
Staff(SSN, Name, Surname, Address, Association*,Type)
Time(Date)
Specialization(Specialization)
Laboratory(CodLab, CodH, NameLab, Plan, Room)
Department(CodD, CodH, Name, Telephone)
Booking(CodTes, CodE, Date, Time, Cost, isUrgent)
DoctorRole(SSN, StartDate, EndDate*, Role)

Binary one-to-many Work in relationship



Translation of the Work in relationship

Patient(CodTes, Name, Surname, Address, BirthPlace, BirthDate)

Hospital(CodH, Name, Address)

Examination(CodE, Description, DietDescription*, Type, SSN*)

Staff(SSN, Name, Surname, Address, Association*,Type,
CodD, CodH)

Time(Date)

Specialization(Specialization)

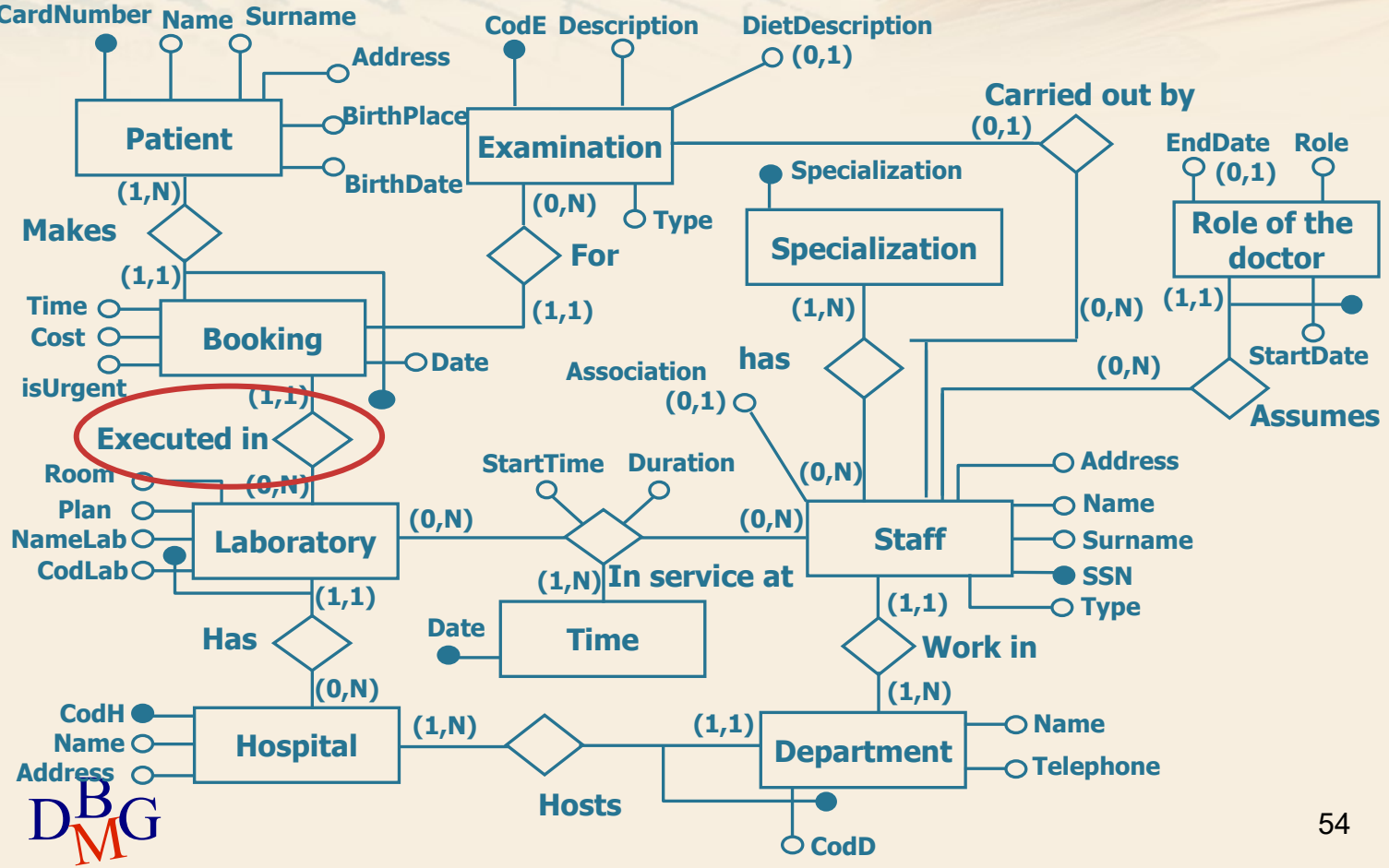
Laboratory(CodLab, CodH, NameLab, Plan, Room)

Department(CodD, CodH, Name, Telephone)

Booking(CodTes, CodE, Date, Time, Cost, isUrgent)

DoctorRole(SSN, StartDate, EndDate*, Role)

Binary one-to-many Executed in relationship



Translation of the Executed in relationship

Patient(CodTes, Name, Surname, Address, BirthPlace, BirthDate)

Hospital(CodH, Name, Address)

Examination(CodE, Description, DietDescription*, Type, SSN*)

Staff(SSN, Name, Surname, Address, Association*,Type,
CodD, CodH)

Time(Date)

Specialization(Specialization)

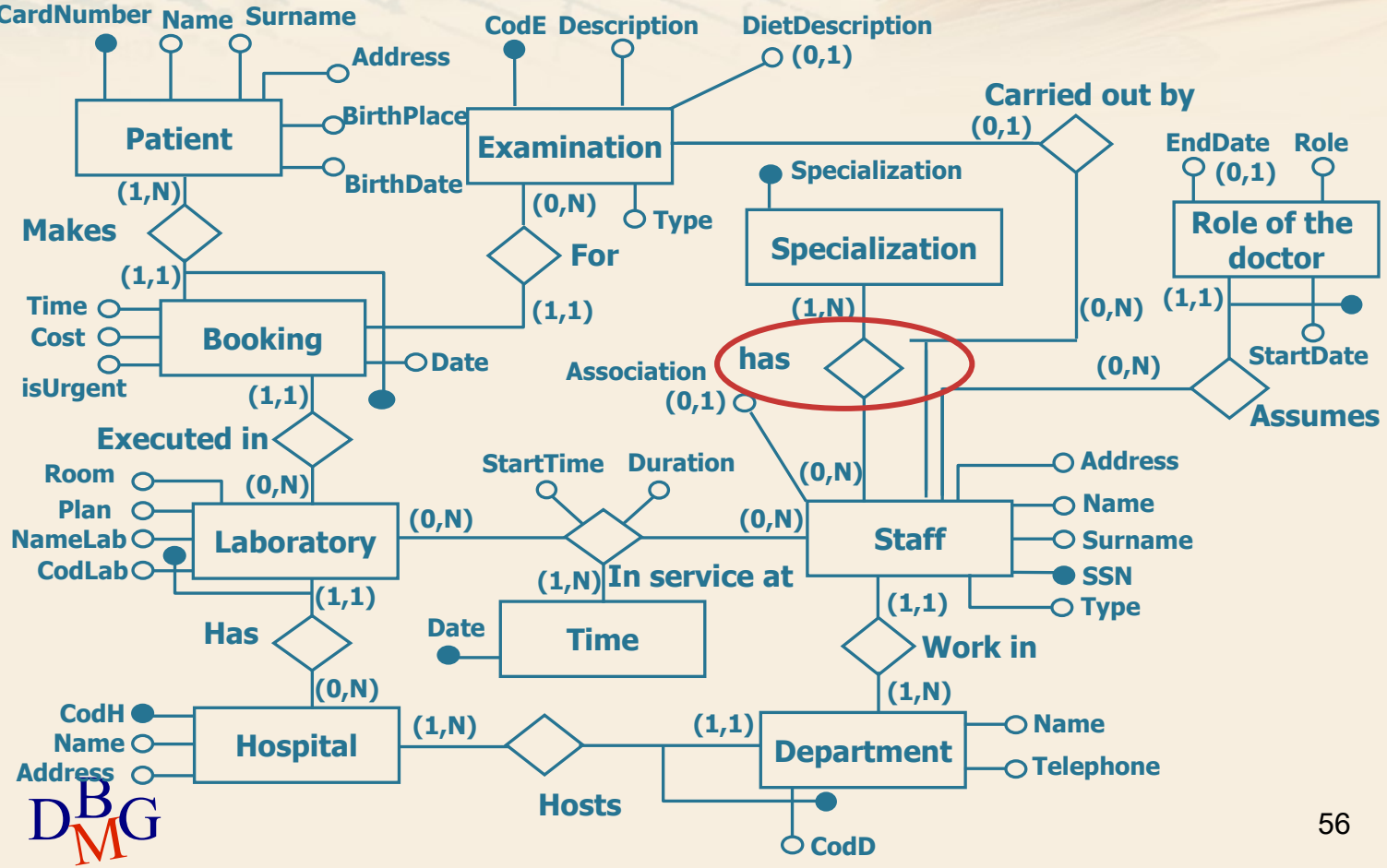
Laboratory(CodLab, CodH, NameLab, Plan, Room)

Department(CodD, CodH, Name, Telephone)

Booking(CodTes, CodE, Date, Time, Cost, isUrgent,
CodLab, CodH)

DoctorRole(SSN, StartDate, EndDate*, Role)

Binary many-to-many Hosts in relationship



Translation of the Hosts relationship

Patient(CodTes, Name, Surname, Address, BirthPlace, BirthDate)

Hospital(CodH, Name, Address)

Examination(CodE, Description, DietDescription*, Type, SSN*)

Staff(SSN, Name, Surname, Address, Association*,Type,
CodD, CodH)

Time(Date) Specialization(Specialization)

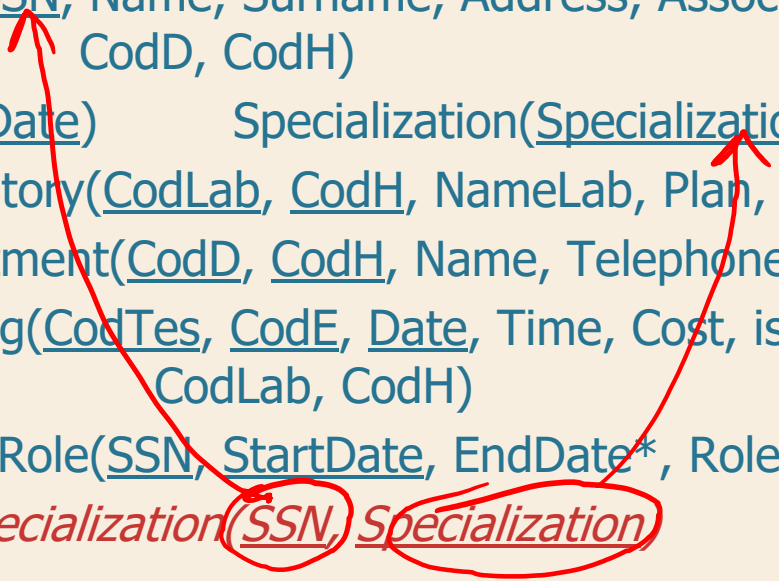
Laboratory(CodLab, CodH, NameLab, Plan, Room)

Department(CodD, CodH, Name, Telephone)

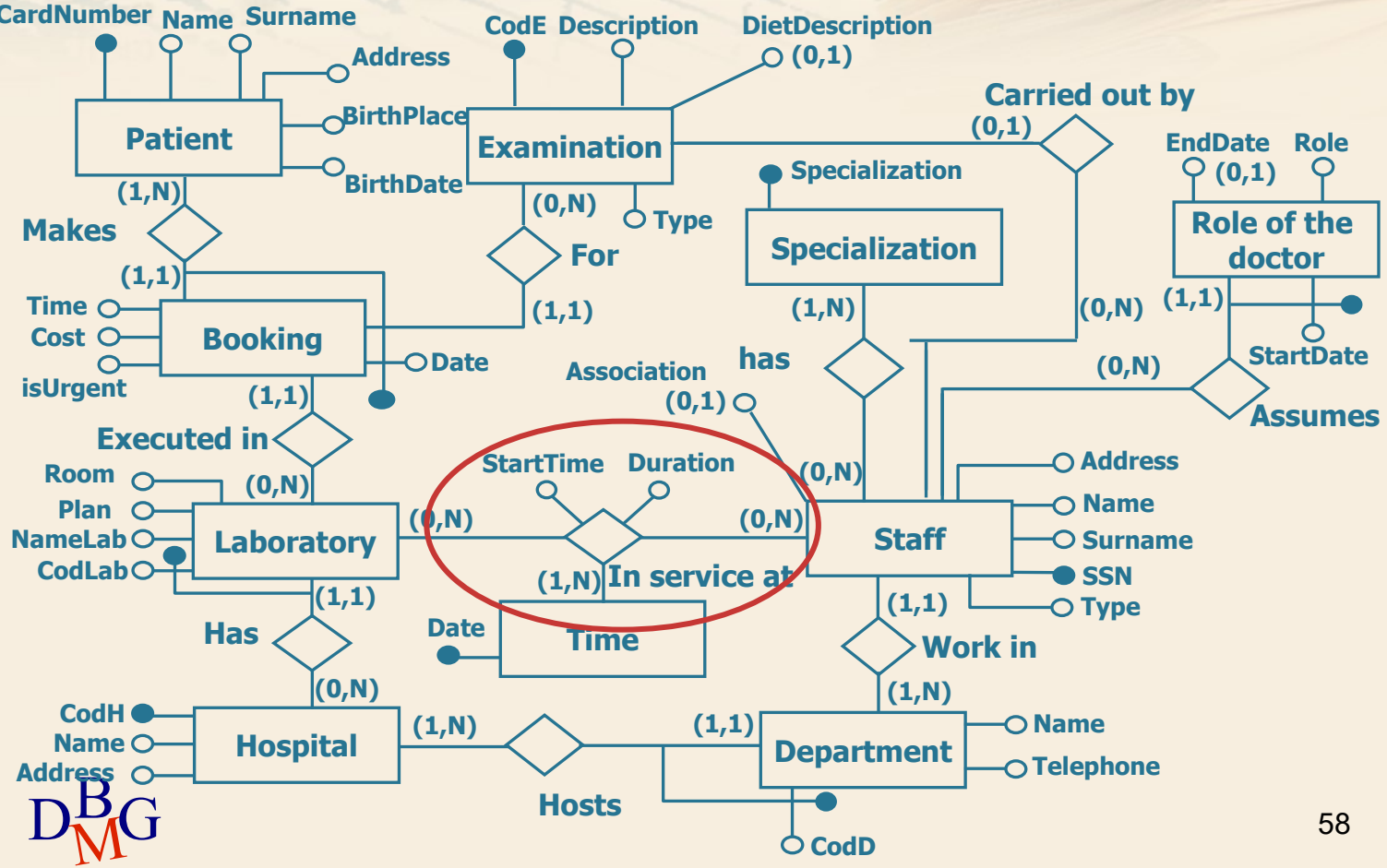
Booking(CodTes, CodE, Date, Time, Cost, isUrgent,
CodLab, CodH)

DoctorRole(SSN, StartDate, EndDate*, Role)

HasSpecialization(SSN, Specialization)



Ternary many-to-many In service at relationship



Translation of the In service at relationship

Patient(CodTes, Name, Surname, Address, BirthPlace, BirthDate)

Hospital(CodH, Name, Address)

Examination(CodE, Description, DietDescription*, Type, SSN*)

Staff(SSN, Name, Surname, Address, Association*,Type,
CodD, CodH)

Time(Date) Specialization(Specialization)

Laboratory(CodLab, CodH, NameLab, Plan, Room)

Department(CodD, CodH, Name, Telephone)

Booking(CodTes, CodE, Date, Time, Cost, isUrgent,
CodLab, CodH)

DoctorRole(SSN, StartDate, EndDate*, Role)

HasSpecialization(SSN, Specialization)

InServiceAt(SSN, CodLab, CodH, Date,

Translation of the In service at relationship

Patient(CodTes, Name, Surname, Address, BirthPlace, BirthDate)

Hospital(CodH, Name, Address)

Examination(CodE, Description, DietDescription*, Type, SSN*)

Staff(SSN, Name, Surname, Address, Association*,Type,
CodD, CodH)

Time(Date) Specialization(Specialization)

Laboratory(CodLab, CodH, NameLab, Plan, Room)

Department(CodD, CodH, Name, Telephone)

Booking(CodTes, CodE, Date, Time, Cost, isUrgent,
CodLab, CodH)

DoctorRole(SSN, StartDate, EndDate*, Role)

HasSpecialization(SSN, Specialization)

InServiceAt(SSN, CodLab, CodH, Date, StartTime, Duration)

Redundant tables elimination

Patient(CodTes, Name, Surname, Address, BirthPlace, BirthDate)

Hospital(CodH, Name, Address)

Examination(CodE, Description, DietDescription*, Type, SSN*)

Staff(SSN, Name, Surname, Address, Association*,Type, CodD, CodH)

Time(Date) ~~Specialization(Specialization)~~

Laboratory(CodLab, CodH, NameLab, Plan, Room)

Department(CodD, CodH, Name, Telephone)

Booking(CodTes, CodE, Date, Time, Cost, isUrgent, CodLab, CodH)

DoctorRole(SSN, StartDate, EndDate*, Role)

HasSpecialization(SSN, Specialization)

InServiceAt(SSN, CodLab, CodH, Date, StartTime, Duration)

Redundant tables elimination

Patient(CodTes, Name, Surname, Address, BirthPlace, BirthDate)

Hospital(CodH, Name, Address)

Examination(CodE, Description, DietDescription*, Type, SSN*)

Staff(SSN, Name, Surname, Address, Association*,Type,
CodD, CodH)

~~Time(Date)~~

Laboratory(CodLab, CodH, NameLab, Plan, Room)

Department(CodD, CodH, Name, Telephone)

Booking(CodTes, CodE, Date, Time, Cost, isUrgent,
CodLab, CodH)

DoctorRole(SSN, StartDate, EndDate*, Role)

HasSpecialization(SSN, Specialization)

InServiceAt(SSN, CodLab, CodH, Date, StartTime, Duration)

Final relational scheme

Patient(CodTes, Name, Surname, Address, BirthPlace, BirthDate)

Hospital(CodH, Name, Address)

Examination(CodE, Description, DietDescription*, Type, SSN*)

Staff(SSN, Name, Surname, Address, Association*,Type,
CodD, CodH)

Laboratory(CodLab, CodH, NameLab, Plan, Room)

Department(CodD, CodH, Name, Telephone)

Booking(CodTes, CodE, Date, Time, Cost, isUrgent,
CodLab, CodH)

DoctorRole(SSN, StartDate, EndDate*, Role)

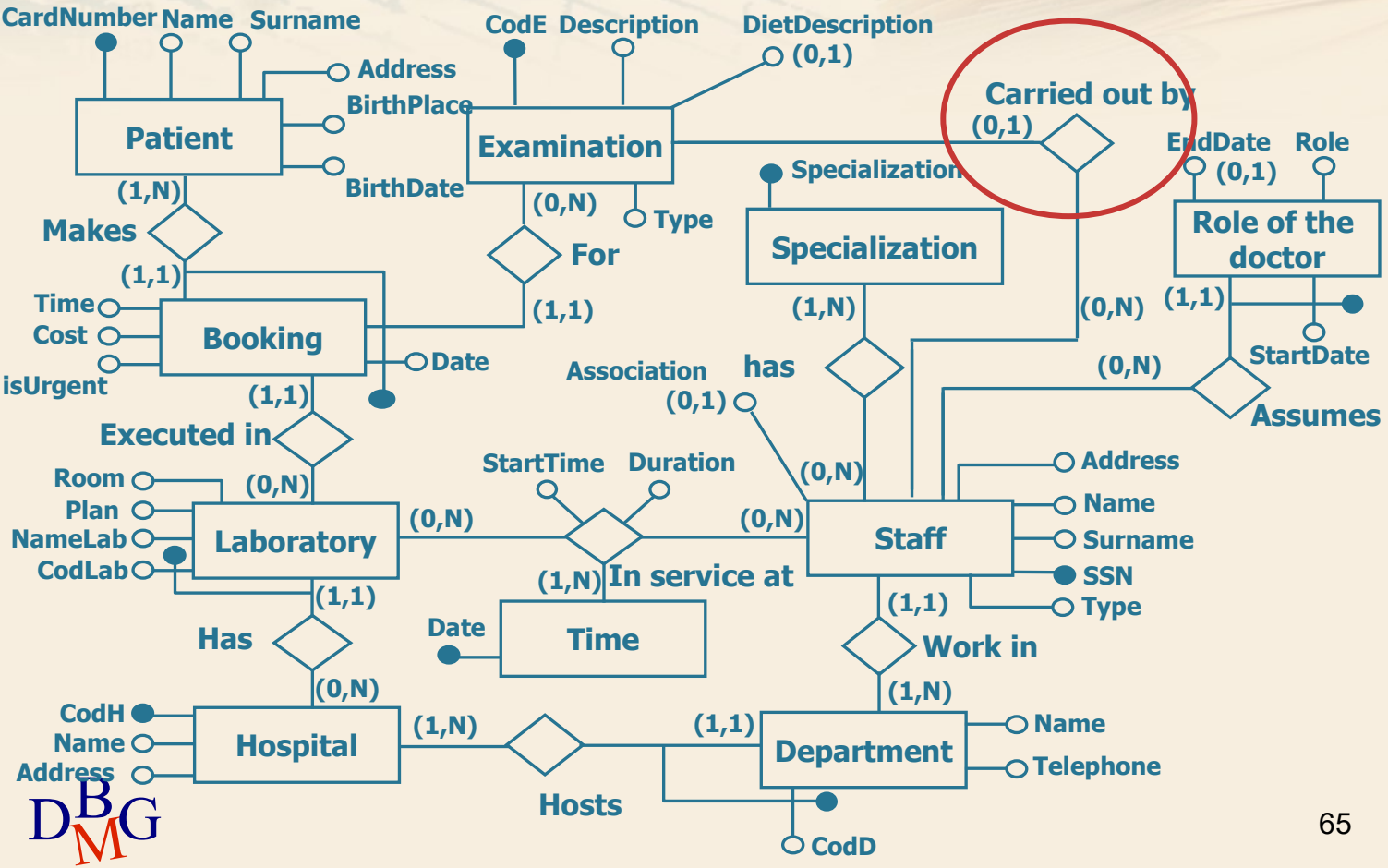
HasSpecialization(SSN, Specialization)

InServiceAt(SSN, CodLab, CodH, Date, StartTime, Duration)

Example of relational logic design

Referential integrity constraints

Referential integrity: Carried out by relationship



Referential integrity: Carried out by relationship

- Involved tables

Examination(CodE, Description, DietDescription*, Type, *SSN**)

Staff(SSN, Name, Surname, Address, Association*,Type,
CodD, CodH)

- Referential integrity constraint

Examination(SSN) REFERENCES Staff(SSN)

Referential integrity: Work in relationship

- Involved tables

Staff(SSN, Name, Surname, Address, Association*,Type,
CodD, CodH)

Department(CodD, CodH, Name, Telephone)

- Referential integrity constraint

Staff(CodD,CodH) REFERENCES Department(CodD,CodH)

Referential integrity: Hosts relationship

- Involved tables

Department(CodD, *CodH*, Name, Telephone)

Hospital(CodH, Name, Address)

- Referential integrity constraint

Department(CodH) REFERENCES Hospital(CodH)

Referential integrity: Has relationship

- Involved tables

Laboratory(CodLab, *CodH*, NameLab, Plan, Room)

Hospital(CodH, Name, Address)

- Referential integrity constraint

Laboratory(CodH) REFERENCES Hospital(CodH)

Referential integrity: Makes relationship

- Involved tables

Booking(*CodTes*, CodE, Date, Time, Cost, isUrgent, CodLab, CodH)

Patient(CodTes, Name, Surname, Address, BirthPlace, BirthDate)

- Referential integrity constraint

Booking(CodTes) REFERENCES Patient(CodTes)

Referential integrity: For relationship

- Involved tables

Booking(CodTes, *CodE*, Date, Time, Cost, isUrgent, CodLab, CodH)

Examination(CodE, Description, DietDescription*, Type, SSN*)

- Referential integrity constraint

Booking(CodE) REFERENCES Examination(CodE)

Referential integrity: Executed in relationship

- Involved tables

Booking(CodTes, CodE, Date, Time, Cost, isUrgent, *CodLab, CodH*)

Laboratory(CodLab, CodH, NameLab, Plan, Room)

- Referential integrity constraint

Booking(CodLab,CodH) REFERENCES Laboratory(CodLab,CodH)

Referential integrity: Assumes relationship

- Involved tables

DoctorRole(*SSN*, StartDate, EndDate*, Role)

Staff(SSN, Name, Surname, Address, Association*,Type, CodD, CodH)

- Referential integrity constraint

DoctorRole(SSN) REFERENCES Staff(SSN)

Referential integrity: Hosts relationship

- Involved tables

HasSpecialization(*SSN*, Specialization)

Staff(SSN, Name, Surname, Address, Association*,Type, CodD, CodH)

- Referential integrity constraint

HasSpecialization(SSN) REFERENCES Staff(SSN)

Referential integrity: In service at relationship

- Involved tables

InServiceAt(*SSN*, CodLab, CodH, Date, StartTime, Duration)

Staff(SSN, Name, Surname, Address, Association*,Type,
CodD, CodH)

- Referential integrity constraint

InServiceAt(SSN) REFERENCES Staff(SSN)

Referential integrity: In service at relationship

- Involved tables

InServiceAt(SSN, *CodLab*, *CodH*, Date, StartTime, Duration)

Laboratory(CodLab, CodH, NameLab, Plan, Room)

- Referential integrity constraint

InServiceAt(CodLab,CodH) REFERENCES Laboratory(CodLab,CodH)

Referential integrity constraints

Examination(SSN) REFERENCES Staff(SSN)
Staff(CodD,CodH) REFERENCES Department(CodD,CodH)
Department(CodH) REFERENCES Hospital(CodH)
Laboratory(CodH) REFERENCES Hospital(CodH)
Booking(CodTes) REFERENCES Patient(CodTes)
Booking(CodE) REFERENCES Examination(CodE)
Booking(CodLab,CodH) REFERENCES Laboratory(CodLab,CodH)
DoctorRole(SSN) REFERENCES Staff(SSN)
HasSpecialization(SSN) REFERENCES Staff(SSN)
InServiceAt(SSN) REFERENCES Staff(SSN)
InServiceAt(CodLab,CodH) REFERENCES Laboratory(CodLab,CodH)