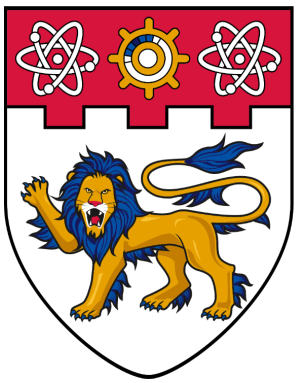

NANYANG TECHNOLOGICAL UNIVERSITY
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SC2207: Introduction to Databases
Lab 3 Report

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School of Computer Science and Engineering
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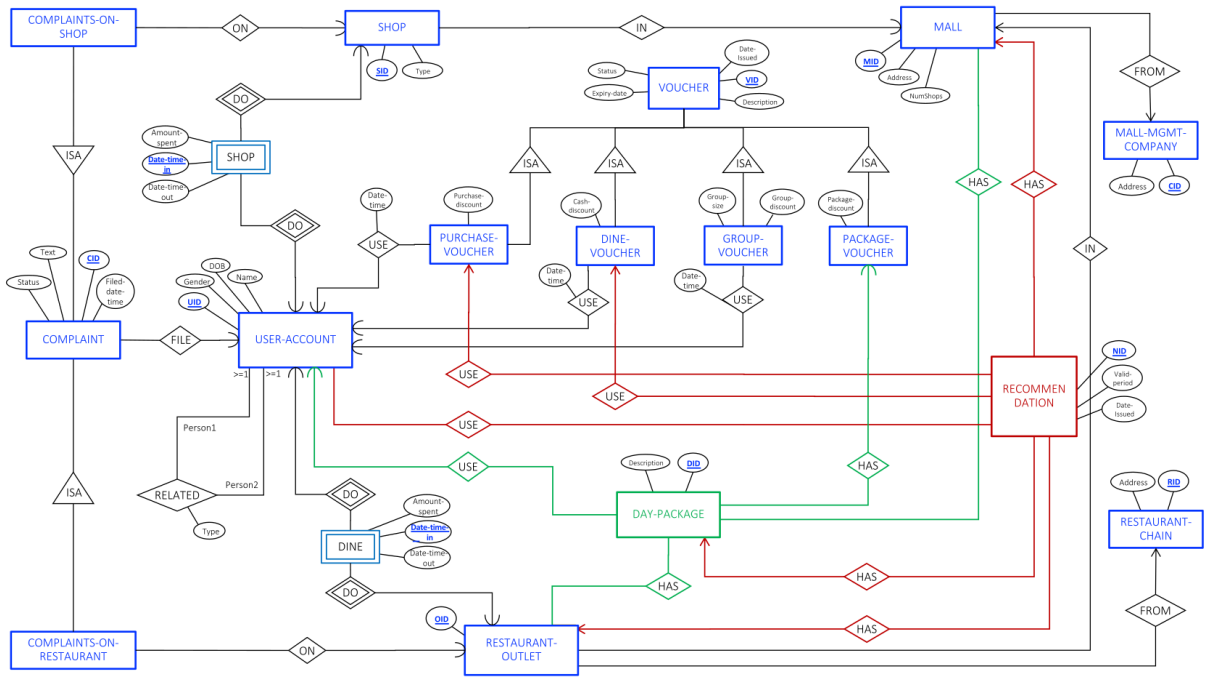
2023/2024 Semester 2

Conventions:

Since there are multiple “HAS” and “USE” relationships in the ER diagram, we will differentiate their respective relations using the following format.

- If there is a “USE” relationship between “A” and “B”, the relation is “A-USE-B”.
- If there is a “HAS” relationship between “A” and “B”, the relation is “A-HAS-B”.

Updated ER Diagram



COMPLAINT(CID, Text, Status, Filed-date-time, UID) /
Keys: CID
Primary Key: CID
FDs:
- CID → Text, Status, Filed-dated-time, UID

The table is in 3NF.
The table is in BCNF.

COMPLAINTS-ON-SHOP(CID, SID) //
Keys: CID
Primary Key: CID
FDs:
- CID → SID

The table is in 3NF.
The table is in BCNF.

COMPLAINTS-ON-RESTAURANT(CID, OID) //
Keys: CID
Primary Key: CID
FDs:
- CID → OID

The table is in 3NF.
The table is in BCNF.

SHOP(SID, Type, MID) //
Keys: SID
Primary Key: SID
FDs:
- SID → {Type, MID}

The table is in 3NF.
The table is in BCNF.

SHOP-RECORD(SID, UID, Date-time-in, Amount-spent, Date-time-out) //
Keys: {SID, UID, Date-time-in}, {SID, UID, Date-time-out}
Primary Key: {SID, UID, Date-time-in}
Assumption: The same user can visit the same store at different times. Therefore SID and UID alone cannot determine all other attributes, and we need a Date-time-in to identify each shopping instance.
FDs:
- {SID, UID, Date-time-in} → Amount-spent, Date-time-out

- {SID, UID, Date-time-out} → Amount-spent, Date-time-in

The table is in 3NF.
The table is in BCNF.

USER-RELATIONSHIP(P1_UID, P2_UID, Type) //
Keys: {P1_UID, P2_UID}
Primary Key: {P1_UID, P2_UID}
FDs:

- {P1_UID, P2_UID} → Type

The table is in 3NF.
The table is in BCNF.

USER-ACCOUNT(UID, Gender, DOB, Name) /
Keys: UID
Primary Key: UID
FDs:

- UID → {Gender, DOB, Name}

The table is in 3NF.
The table is in BCNF.

DINE-RECORD(UID, OID, Date-time-In, AmountSpent, Date-time-Out) //
Keys: {UID, OID, Date-time-In}, {UID, OID, Date-time-Out}
Primary Key: {UID, OID, Date-time-In}
Assumption: The same user can visit the same restaurant at different times. Therefore UID and OID alone cannot determine all other attributes, and we need a Date-time-in to identify each dining instance.
FDs:

- {UID, OID, Date-time-In} → {AmountSpent, Date-time-Out}
- {UID, OID, Date-time-Out} → {AmountSpent, Date-time-In}

The table is in 3NF.
The table is in BCNF.

RESTAURANT-OUTLET(OID, MID, RID) //
Keys: OID
Primary Key: OID
FDs:

- OID → {MID, RID}

The table is in 3NF.
The table is in BCNF.

USER-USE-RECOMMENDATION(UID, NID) //
Keys: {UID, NID}
Primary Key: {UID, NID}
FDs:
- {UID, NID} → {UID, NID}

The table is in 3NF.
The table is in BCNF.

RECOMMENDATION(NID, Valid-period, Date-Issued, MID, DID, OID, UID, VID) //
Keys: NID
Primary Key: NID
Assumption: Each recommendation can only use one voucher at a time.
FDs:
- NID → {Valid-period, Date-Issued, MID, DID, OID, UID, VID}

The table is in 3NF.
The table is in BCNF.

MALL(MID, Address, NumShops, CID) /
Keys: MID, Address
Primary Key: MID
FDs:
- MID → {Address, NumShops, CID}
- Address → MID

The table is in 3NF.
The table is in BCNF.

MALL-MGMT-COMPANY(CID, Address) /
Keys: CID, Address
Primary Key: CID
FDs:
- CID → Address
- Address → CID

The table is in 3NF.
The table is in BCNF.

RESTAURANT-CHAIN(RID, Address) /
Keys: RID, Address
Primary Key: RID
FDs:
- RID → Address
- Address → RID

The table is in 3NF.
The table is in BCNF.

DAY-PACKAGE(DID, Description, VID, UID) //
Keys: DID
Primary Key: DID
FDs:
- DID → {Description, VID, UID}

The table is in 3NF.
The table is in BCNF.

RESTAURANT-OUTLET-HAS-DAY-PACKAGE(DID, OID)//
Key: {DID, OID}
Primary Key: {DID, OID}
FDs:
- {DID, OID} → {DID, OID}

The table is in 3NF.
The table is in BCNF.

MALL-HAS-DAY-PACKAGE(DID, MID) //
Key: {DID, MID}
Primary Key: {DID, MID}
FDs:
- {DID, MID} → {DID, MID}

The table is in 3NF.
The table is in BCNF.

VOUCHER(VID, Description, Expiry-date, Status, Date-issued) /
Keys: VID
Primary Key: VID
FDs:
- VID → {Description, Expiry-date, Status, Date-issued}

The table is in 3NF.
The table is in BCNF.

PURCHASE-VOUCHER(VID, Purchase-discount, UID, Date-time) /
Keys: VID
Primary Key: VID
FDs:
- VID → {Purchase-discount, UID, Date-time}

The table is in 3NF.
The table is in BCNF.

DINE-VOUCHER(VID, Cash-discount, UID, Date-time) /
Keys: VID
Primary Key: VID
FDs:
- VID → {Cash-discount, UID, Date-time}

The table is in 3NF.
The table is in BCNF.

PACKAGE-VOUCHER(VID, Package-discount) /
Keys: VID
Primary Key: VID
FDs:
- VID → Package-discount

The table is in 3NF.
The table is in BCNF.

GROUP-VOUCHER(VID, Group-size, Group-discount, UID, Date-time)
Keys: VID
Primary Key: VID
Assumption: Every group-size has a corresponding fixed group-discount, eg: group-size of 2 will always get a 20% discount, group-size of 3 will always get 25% discount, etc.
FDs:

- VID → {Group-size, Group-discount, UID, Date-time}
- Group-size → Group-discount

The FD Group-size → Group-discount violates 3NF as Group-size is not a key and Group-discount is not contained in any key.
The table is not in BCNF.

Decomposing Group-Voucher:
Step 1: Minimal basis for Group-Voucher: {VID → Group-size; VID → UID; VID → Date-time; Group-size → Group-discount}

Step 2: Combine the FDs whose left-hand sides are the same.
S = {VID → Group-size, Group-discount, UID, Date-time;
Group-size → Group-discount}

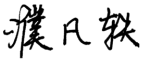
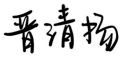
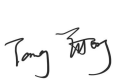
Step 3: Create a table for each FD remained:
Group-Voucher-1(Group-size, Group-discount)
Keys: Group-size
Primary key: Group-size
FDs: Group-size → Group-discount
The table is in 3NF.
The table is in BCNF.

Group-Voucher-2(VID, Group-size, UID, Date-time)
Keys: VID
Primary key: VID
FDs: VID → Group-size, UID, Date-time
The table is in 3NF.
The table is in BCNF.

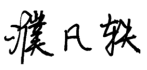
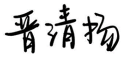
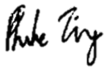
Step 4: Check: Group-Voucher-2 contains a key from the original relation.
Step 5: Check: There's no redundant table.

Appendixes

Appendix A: Individual Contribution Form

Full Name	Individual Contribution to Lab 2 Submission	Percentage of Contribution	Signature
Pu Fanyi	Relational Schema	14.29%	
Jin Qingyang			
Qian Jianheng Oscar			
Soo Ying Xi			
Ting Ruo Chee			
Ye Yuhan			
Tang Yutong			

Appendix B: Individual Contribution Form

Team member	Signature	Date	A or B*
Pu Fanyi		13/Mar/2024	A
Jin Qingyang			
Qian Jianheng Oscar			
Soo Ying Xi			
Ting Ruo Chee			
Ye Yuhan			
Tang Yutong			

* Each team member should indicate either A or B:
  A. I affirm that my contribution(s) to the lab work is my own, produced without help from any AI tool(s).
  B. I affirm that my contribution(s) to the lab work has been produced with the use of AI tool(s).