

Anji Zhou

Assignment 3 - Normalization

2/24/25

Question 1 - Happy Supplies Parts Warehouse

Step 1: Assumptions and initial table

- The employee assisting the customer is recorded, but there is no special relationship between specific employees and customers.
- Employees can help any and all customers
- Customers can order multiple parts and each part multiple times
- Cages are used to store inventory and the cageCode uniquely identifies the cage/shelf.
- Each part has a fixed price that doesn't change, the unitPrice does not vary per order
- Each customer is uniquely identified by customerNumber and each part by partNumber.

customerName	customerNumber	customerType	date	time	employee	partNumber	partName	partType	cageCode	quantityOrdered	unitPrice
Jeff Peterson	HG54587	Consumer	7/1/2024	10:30 AM	D. Harrison	10654	Float Control	Plumbing	G413	4	12
Jeff Peterson	HG54587	Consumer	7/1/2024	10:30 AM	D. Harrison	10456	Modulator	Electrical	H433	3	7
Jeff Peterson	HG54587	Consumer	7/1/2024	10:30 AM	D. Harrison	10776	House Assembly	Plumbing	G413	7	9
Jeff Peterson	HG54587	Consumer	7/1/2024	10:30 AM	D. Harrison	10657	Float Assembly	Plumbing	G413	5	10

Step 2: Normalize to 1NF

- This table is already in 1NF because
 - Each column contains atomic values and there are no repeating groups
 - The composite Primary Keys are **customerNumber**, **partNumber**, **date**, and **time**

<u>customerNumber</u>	customerName	customerType	<u>date</u>	<u>time</u>	employee	<u>partNumber</u>	partName	partType	cageCode	quantityOrdered	unitPrice
HG54587	Jeff Peterson	Consumer	7/1/2024	10:30 AM	D. Harrison	10654	Float Control	Plumbing	G413	4	12
HG54587	Jeff Peterson	Consumer	7/1/2024	10:30 AM	D. Harrison	10456	Modulator	Electrical	H433	3	7
HG54587	Jeff Peterson	Consumer	7/1/2024	10:30 AM	D. Harrison	10776	House Assembly	Plumbing	G413	7	9
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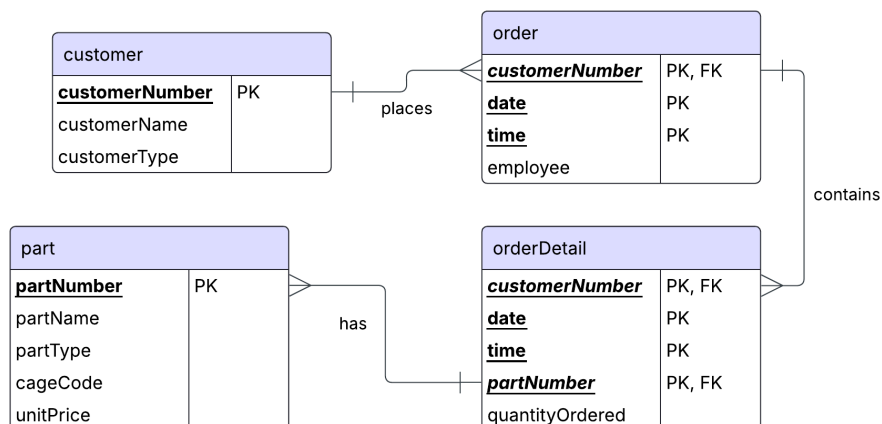
Step 3: Normalize to 2NF

- Non-key attributes should be dependent on the whole primary key (customerNumber, date, time and partNumber) so we have to remove partial dependencies
- We have to split the tables up into three: Customers, Parts, and Orders, because
 - customerName, customerType, and employee depend only on customerNumber
 - partName, partType, cageCode, and unitPrice depend only on partNumber
- Each order can contain multiple parts and each part can be included in many different orders, which leads to a many-to-many relationship
 - We need another bridging table: OrderDetails table

customer				
<u>customerNumber</u>	customerName	customerType		
HG54587	Jeff Peterson	Consumer		
order				
<u>customerNumber</u>	<u>date</u>	<u>time</u>	employee	
HG54587	7/1/2024	10:30 AM	D. Harrison	
part				
<u>partNumber</u>	partName	partType	cageCode	unitPrice
10654	Float Control	Plumbing	G413	12
10456	Modulator	Electrical	H433	7
10776	House Assembly	Plumbing	G413	9
10657	Float Assembly	Plumbing	G413	10
orderDetail				
<u>customerNumber</u>	<u>date</u>	<u>time</u>	<u>partNumber</u>	quantityOrdered
HG54587	7/1/2024	10:30 AM	10654	4
HG54587	7/1/2024	10:30 AM	10456	3
HG54587	7/1/2024	10:30 AM	10776	7
HG54587	7/1/2024	10:30 AM	10657	5

Step 4: Normalizing to 3NF

- All transitive dependencies must be removed, so non-key attributes depend only on the primary key and not other non-key attributes
- The Customers Table is already in 3NF because all attributes depend on the PK customerNumber
- Parts Table is also in 3NF because all attributes depend on the PK partsNumber
- Orders Table is in 3NF because the order depend directly on customerNumber, date, and time
- OrderDetails Table is in 3NF because quantityOrdered depends on the composite PK
- The final tables in 3NF with PK, FK, and relations are as follows:



Question 2 - Therapists at Panacea Mental Health Corporation

Step 1: Assumptions and initial table

staffNo	therapistName	patNo	patName	appointment date	time	branchNo
S1011	Fred Smith	P100	Lily White	9/12/2022	10:00	M15
S1011	Fred Smith	P105	Jill Baker	9/12/2022	12:00	M15
S1024	Heidi Pierce	P108	Andy McKee	9/12/2022	10:00	Q10
S1024	Heidi Pierce	P108	Andy McKee	9/14/2022	14:00	Q10
S1032	Richard Levin	P105	Jill Baker	9/14/2022	16:30	M15
S1032	Richard Levin	P110	Jimmy Winter	9/15/2022	18:00	B13

- Each therapist can work at multiple branches
- Each therapist can see patients at only one branch per day
- Each therapist can only have one appointment at one time
- A patient can have multiple appointments on the same day or across different days
- A patient can see multiple therapists but only one in the same appointment

Step 2: Normalizing to 1NF

- This table is already in 1NF because
 - Each column contains atomic values and there are no repeating groups
 - The composite Primary Keys are **staffNo**, **appointmentDate**, and **appointmentTime**

<u>staffNo</u>	therapistName	patNo	patName	<u>appointmentDate</u>	<u>appointmentTime</u>	branchNo
S1011	Fred Smith	P100	Lily White	9/12/2022	10:00	M15
S1011	Fred Smith	P105	Jill Bake	9/12/2022	12:00	M15
S1024	Heidi Pierce	P108	Andy McKee	9/12/2022	10:00	Q10
S1024	Heidi Pierce	P108	Andy McKee	9/14/2022	14:00	Q10
S1032	Richard Levin	P105	Jill Bake	9/14/2022	16:30	M15
S1032	Richard Levin	P110	Jimmy Winter	9/15/2022	18:00	B13

Step 3: Normalize to 2NF

- All partial dependencies need to be removed, so all non-key attributes have to depend on the entire primary key
 - therapistName depends only on staffNo
 - patName depends only on patNo

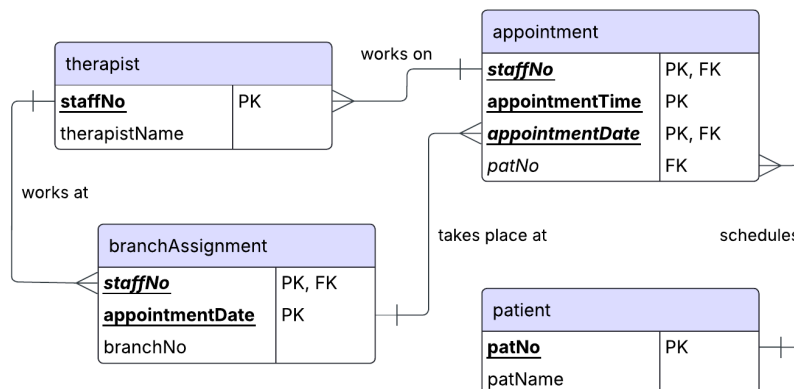
- branchNo depends on staffNo and appointmentDate because each therapist can only work at one branch per day
- Thus, we split the table into four tables: therapist, patient, branchAssignment, and appointment:

therapist			appointment			
<u>staffNo</u>	therapistName		<u>staffNo</u>	patNo	<u>appointmentDate</u>	<u>appointmentTime</u>
S1011	Fred Smith		S1011	P100	9/12/2022	10:00
S1024	Heidi Pierce		S1011	P105	9/12/2022	12:00
S1032	Richard Levin		S1024	P108	9/12/2022	10:00
			S1024	P108	9/14/2022	14:00
			S1032	P105	9/14/2022	16:30
			S1032	P110	9/15/2022	18:00

branchAssignment			patient	
<u>staffNo</u>	<u>appointmentDate</u>	branchNo	<u>patNo</u>	patName
S1011	9/12/2022	M15	P100	Lily White
S1024	9/12/2022	Q10	P105	Jill Bake
S1024	9/14/2022	Q10	P108	Andy McKee
S1032	9/14/2022	M15	P110	Jimmy Winter
S1032	9/15/2022	B13		

Step 4: Normalizing to 3NF

- All transitive dependencies need to be removed to achieve 3NF. Non-key attributes should only depend on its primary key and not other non-key attributes
 - therapistName depends only on staffNo in therapist table
 - patNo depends on staffNo, appointmentDate, and appointmentTime
 - branchNo depends on staffNo and appointmentDate
 - patName depends only on patNo
- No further splitting is required because all non-key attributes depend on its primary key(s). The final tables in 3NF with PK, FK, and relations are as follows:



Question 3 - Maid Better temp agency

Step 1: Assumptions and initial table

- An employee is uniquely identified by eNo and can work on multiple contracts
- Each contract applies to only one event
- There may be multiple contrast for the same event

eNo	contractNo	hours	eName	eventNo	eventLoc
1135	C1024	16	Smith J	H25	Queens
1057	C1024	24	Hocine D	H25	Queens
1068	C1025	28	White T	H4	Yonkers
1135	C1025	15	Smith J	H4	Yonkers
1135	C1026	10	Smith J	H25	Queens

Step 2: Normalizing to 1NF

- This table is already in 1NF because
 - Each column contains atomic values and there are no repeating groups
 - The composite Primary Keys are **eNo** and **contractNo**

<u>eNo</u>	<u>contractNo</u>	hours	eName	eventNo	eventLoc
1135	C1024	16	SmithJ	H25	Queens
1057	C1024	24	Hocine D	H25	Queens
1068	C1025	28	White T	H4	Yonkers
1135	C1025	15	SmithJ	H4	Yonkers
1135	C1026	10	SmithJ	H25	Queens

Step 3: Normalizing to 2NF

- All partial dependencies need to be removed so all non-key attributes need to depend on the entire primary key (eNo and contractNo).
 - eName depends only on eNo but not contractNo
 - eventNo and eventLoc depend only on contractNo but not eNo
- Thus, the table needs to be split into three tables: employee, contract, and eventDetail

contract				
<u>eNo</u>	<u>contractNo</u>	hours	eventNo	
1135	C1024	16	H25	
1057	C1024	24	H25	
1068	C1025	28	H4	
1135	C1025	15	H4	
1135	C1026	10	H25	
employee			eventDetail	
<u>eNo</u>	eName		<u>eventNo</u>	eventLoc
1135	SmithJ		H25	Queens
1057	Hocine D		H4	Yonkers
1068	White T			

Step 4: Normalizing to 3NF

- All transitive dependencies must be removed, so no non-key attributes should depend on another non-key attribute)
 - In contract table, hours and eventNo only depend on eNo and contractNo
 - In employee table, eName depends only on eNo, which is unique to it
 - In eventDetail table, eventLoc depends only on eventNo
- No further splitting is required because all non-key attributes depend on its primary key(s). The final tables in 3NF with PK, FK, and relations are as follows:

