1. Local Supply Company

(a). Assumptions: • A customer can have many orders.

• The customer number uniquely identifies a customer.

• Each customer has a customer type. • Employees help any and all different customers, but one employee helps one

customer at a time. • The part number uniquely identifies each part.

• Different parts can have the same cage code.

(b). The raw table (all the data in one table):

partNumber	partName	partType	cageCode	quantityOrdered	unitPrice	customerNumber	customerName	customerType	orderDate	orderTime	employee
10654	Float Control	Plumbing	G413	4	12	HG54587	Jeff Peterson	Consumer	07-01-2024	10:30 a.m	D. Harrison
10456	Modulator	Electrical	H433	3	7	HG54587	Jeff Peterson	Consumer	07-01-2024	10:30 a.m	D. Harrison
10776	Hose Assembly	Plumbing	G413	7	9	HG54587	Jeff Peterson	Consumer	07-01-2024	10:30 a.m	D. Harrison
10657	Float Assembly	Plumbing	G413	5	10	HG54587	Jeff Peterson	Consumer	07-01-2024	10:30 a.m	D. Harrison

attributes: partNumber, partName, partType, cageCode, quantityOrdered, unitPrice, customerNumber, customerName, customerType, orderDate, orderTime, employee

candidate key: (partNumber, customerNumber, orderDate, orderTime)

reason: A customer can order different parts at different time. So only partNumber + customerNumber + orderDate + orderTime can uniquely identify a record.

dependencies: partNumber → partName, partType, unitPrice

partNumber, customerNumber, orderDate, orderTime → quantityOrdered

customerNumber → customerName, customerType customerNumber, orderDate, orderTime → employee partType → cageCode (transitive dendency: partNumber → cageCode

normal form: 1NF. All the values are atomic values and there's no repeating groups. But there exits partial dependencies so it's not in 2NF and thus is not in 3NF.

conv	ert to 2NI	F:			_					
	part			order	•					
	PK	<u>partNumber</u>	-	PK, FK	<u>partNumber</u>	customer			staff_order	
		partName		PK, FK	<u>customerNumber</u>	PK	<u>customerNumber</u>	+	PK, FK	<u>customerNumber</u>
		partType		PK	<u>orderDate</u>		customerName		PK	<u>orderDate</u>
		cageCode		PK	<u>orderTime</u>		customerType		PK	<u>orderTime</u>
		unitPrice			quantityOrdered					employee
			-							

10776

10657

	pa	artName		PK, FK	<u>customerNumber</u>			PK	customerNum	<u>ıber</u>	PK, FK	<u>customerNumber</u>	
	p	artType		PK	<u>orderDate</u>		·		customerNar	ne	PK	<u>orderDate</u>	
	Ca	ageCode		PK	<u>orderTime</u>				customerTyp	pe e	PK	<u>orderTime</u>	
	u	nitPrice			quantityOrdered				l .			employee	
•	•												
	Data:												
ſ	part					order						customer	
	<u>partNumber</u>	partName	partType	cageCode	unitPrice	<u>partNumber</u>	<u>customerN</u>	<u>umber</u>	<u>orderDate</u>	<u>orderTime</u>	quantityOrdered	customerNun	<u>ıber</u>

10776

	illiterice			quantityOrdered						
Data:										
part					order					
<u>partNumber</u>	partName	partType	cageCode	unitPrice	<u>partNumber</u>	<u>customerNumber</u>	<u>orderDate</u>	<u>orderTime</u>	quantityOrdered	
10654	Float Control	Plumbing	G413	12	10654	HG54587	07-01-2024	10:30 a.m	4	
10456	Modulator	Electrical	H433	7	10456	HG54587	07-01-2024	10:30 a.m	3	

10657

					,			
Explanation:								
I separated the	raw table (1NF)	into four tables t	o remove partia	and transitive dep	endend	ies. All part attri	butes that depend on	ly on
partNumber we	re moved to the	Part table. All cu	ustomer attribute	es that depend only	on cus	stomerNumber w	vere moved to the Cus	stomer table.
Order-level info	rmation such as	employee that of	depends only on	(customerNumber	. order[Date, orderTime)	was moved to the Sta	aff Order table.

10

The remaining Order table keeps the composite key (partNumber, customerNumber, orderDate, orderTime) with quantityOrdered, so every non-key attribute fully depends on the whole key and no transitive dependencies remain. And since there still exists the transitive dependency: partType → cageCode, it's not 3NF yet, and we need to seperate the cageCode and

G413

G413

create a new table part_type to make it 3NF.

So the ultimate 3NF is:

Hose Assembly

Float Assembly

Plumbing

Plumbing

part exists in	order				
PK <u>partNumber</u>	PK, FK <u>partNumber</u>	customer		staff_order	
partName describes	PK, FK <u>customerNumber</u>	is made by PK <u>c</u>	ustomerNumber is served by	PK, FK	<u>customerNumber</u>
partType FK partType	PK <u>orderDate</u>		customerName	PK	<u>orderDate</u>
cageCode unitPrice	PK <u>orderTime</u>		customerType	PK	<u>orderTime</u>
	quantityOrdered				employee

HG54587

HG54587

07-01-2024

07-01-2024

is made by

10:30 a.m

10:30 a.m

customerType

<u>orderTime</u>

Consumer

employee

D. Harrison

customerName

Jeff Peterson

<u>orderDate</u>

Jeff Peterson

staff_order

<u>customerNumber</u>

HG54587

7

5

PK	<u>partType</u>		FK	partType		PK	<u>orde</u> ı	<u>rDate</u>			cu	ıstomerName		PK	01	<u>derDate</u>
	cageCode			unitPrice		PK	<u>order</u>	:Time			CU	ustomerType		PK	<u>or</u>	<u>derTime</u>
			,				quantity	Ordered							e	mployee
																_
Data	:															
part					order											part_type
par	tNumber par	tName	partType	e unitPrice	<u>partNumber</u>	customer	<u>Number</u>	<u>orderDate</u>	<u>orderTime</u>	quantityOrdered	customer	AT 1	rustomerName	customarT	,	<u>partType</u>
											CHETAMARN	Viimhar	uictomarNama I	Clictomar I	vna I	

Data:														
part				(order								part_type	
<u>partNumber</u>	partName	partType	unitPrice	Γ	<u>partNumber</u>	<u>customerNumber</u>	<u>orderDate</u>	<u>orderTime</u>	quantityOrdered	customer			<u>partType</u>	cageCode
	1	1 01		-	-					<u>customerNumber</u>	customerName	customerType	Dlambing	C412
10654	Float Control	Plumbing	12		10654	HG54587	07-01-2024	10:30 a.m	4	HG54587	Jeff Peterson	Consumer	Plumbing	G413
				-						1100 1007	Jen receision	Consumer		
10456	Modulator	Electrical	7		10456	HG54587	07-01-2024	10:30 a.m	3				Electrical	H433
				-						staff_order				
10776	Hose Assembly	Plumbing	9		10776	HG54587	07-01-2024	10:30 a.m	7	<u>customerNumber</u>	<u>orderDate</u>	<u>orderTime</u>	employee	
				-						<u>customerrumber</u>	<u>order Date</u>	<u>order rime</u>	employee	
10657	Float Assembly	Plumbing	10		10657	HG54587	07-01-2024	10:30 a.m	5	HG54587	Jeff Peterson	Consumer	D. Harrison	

- (a). Assumptions: • staffNo uniquely identifies a therapist.
- patNo uniquely identifies a patient. • branchNo uniquely identifies a branch.

2. Therapists Appointment

- A therapist may work at multiple branches across days, but on any given date a therapist works at one branch only. • An appointment is for one patient with one therapist at one
- branch, at a specific appointmentDate and appointmentTime. • A patient may have multiple appointments in a day, including with
- different therapists and at different times.
- (b). The raw table (all the data in one table):
- staffNo therapistName patNo

S1011	Fred Smith	P100	Lily White	09-12-2022	10:00	M15
S1011	Fred Smith	P105	Jill Baker	09-12-2022	12:00	M15
S1024	Heidi Pierce	P108	Andy McKee	09-12-2022	10:00	Q10
S1024	Heidi Pierce	P108	Andy McKee	09-14-2022	14:00	Q10
S1032	Richard Levin	P105	Jill Baker	09-14-2022	16:30	M15
S1032	Richard Levin	P110	Jimmy Winter	09-15-2022	18:00	B13
		1	1		•	

patName

appointmentDate

reason: A patient is given an appointment at a specific time and date at a particular branch with one therapist. So only staffNo + patNo + appointmentDate + appointmentTime can uniquely identify a record. dependencies:

candidate key: (staffNo, patNo, appointmentDate, appointmentTime)

attributes: staffNo, therapistName, patNo, patName, appointmentDate, appointmentTime, branchNo

staffNo → therapistName

appointmentTime

branchNo

patNo → patName staffNo, appointmentDate → branchNo

normal form:

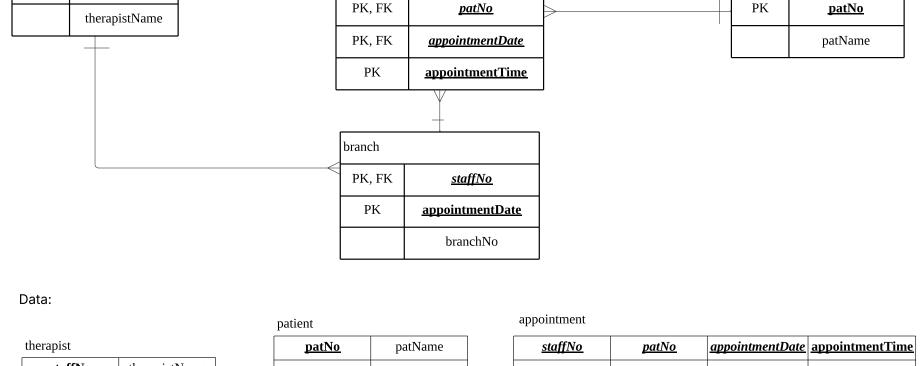
<u>staffNo</u>

1NF. All the values are atomic values and there's no repeating groups. But there exits partial dependencies so it's not in 2NF and thus is not in 3NF.

convert to 2NF: appointment therapist PK, FK patient

<u>staffNo</u>

PK



			patient				appointment			
t	herapist		<u>p</u>	atNo_	patName		<u>staffNo</u>	<u>patNo</u>	<u>appointmentDate</u>	appointmentTi
	<u>staffNo</u>	therapistName	I	' 100	Lily White		S1011	P100	09-12-2022	10:00
	S1011	Fred Smith		·105	Jill Baker		S1011	P105	09-12-2022	12:00
	S1024	Heidi Pierce	r	105	JIII Dakei		31011	P105	09-12-2022	12.00
	0.1.000		I	108	Andy McKee		S1024	P108	09-12-2022	10:00
	S1032	Richard Levin	I	P110	Jimmy Winter	-	S1024	P108	09-14-2022	14:00
	branch					J	S1032	P105	09-14-2022	16:30
	staffNo	appointmentDate	branchNo							
	S1011	09-12-2022	M15				S1032	P110	09-15-2022	18:00
				\dashv						

	S1024	09-14-2022	Q10	
	S1032	09-14-2022	M15	
	S1032	09-15-2022	B13	
_				
	planation:	w table (1NIE) into	o four tables to r	emove partial and transitive dependencies. All part attributes that depend only on staffNo
	•			butes that depend only on patNo were moved to the Patient table. Branch-level information,
		•	-	nentDate) was moved to the Branch table. The remaining Appointment table keeps the

<u>staffNo</u>

therapistName

09-12-2022

So the ultimate 3NF is: appointment therapist PK, FK <u>staffNo</u> patient

<u>patNo</u>

PK, FK

P105

P108

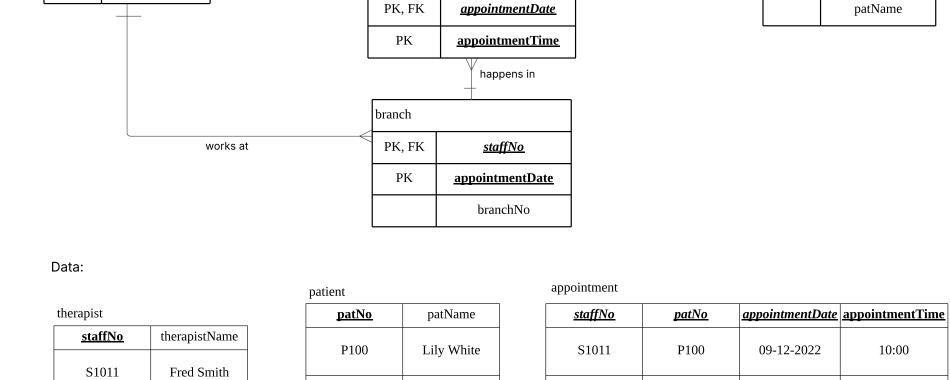
P110

branchNo

And since in all four tables every non-key attribute depends directly on the whole primary key and no non-key attribute depends on another

composite key (staffNo, patNo, appointmentDate, appointmentTime), so every non-key attribute fully depends on the whole primary key.

non-key attribute, there are no transitive dependencies remaining and the design is already in 3NF.



Jill Baker

Andy McKee

Jimmy Winter

eventNo

H25

H25

H4

H4

eventLoc

Queens

Queens

Yonkers

Yonkers

contract

PK

<u>contractNo</u>

eventNo

eventLoc

event_location

PΚ

belongs to

<u>eventNo</u>

eventLoc

S1011 S1024

S1032

staffNo

branch

	S1011	09-12-2022	M15
	S1024	09-12-2022	Q10
	S1024	09-14-2022	Q10
	S1032	09-14-2022	M15
	S1032	09-15-2022	B13
	. 6		
3. Even	t Staff		
Assum	nptions & The ra	w table (all the	data in one tabl

hours

16

24

28

15

eName

Smith J

Hocine D

White T

Smith J

Heidi Pierce

Richard Levin

appointmentDate

	S1011	P105	09-12-2022	12:00
	S1024	P108	09-12-2022	10:00
	S1024	P108	09-14-2022	14:00
_	S1032	P105	09-14-2022	16:30
	S1032	P110	09-15-2022	18:00

is made by

PK

<u>patNo</u>

1068 1135

Data:

Explanation:

Normal Form.

eName

convert to 3NF:

eNo

1135

1057

contractNo

C1024

C1024

C1025

C1025

normal form: 1NF. All the values are atomic values and there's no repeating groups. But there exits partial dependencies so it's not in 2NF and thus is not in 3NF.

convert to 2NF: employee_hour employee PK <u>eNo</u> PK, FK <u>contractNo</u> eName

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

hours

1057	Hocine D	1057	C1024	24	C1025	H4	
1068	White T	1068	C1025	28	C1026	H25	
		1135	C1025	15			
		1135	C1026	10			

keeps the composite key (eNo, contractNo) with hours, so every non-key attribute fully depends on the whole primary key.

Since eventLoc still depends only on eventNo rather than on the whole primary key of the Contract table, there is a transitive dependency between contractNo and eventLoc through eventNo. So it's not 3NF. To remove this redundancy and ensure that every non-key attribute depends only on the key of its own table, we further separate eventNo and eventLoc into the Event table and link it to the Contract table. This eliminates the transitive dependency and brings the design into full Third

I separated the raw table (1NF) into four tables to remove partial and transitive dependencies. All employee attributes that depend only on eNo were moved to the Employee table. All event attributes that depend only on eventNo were moved to the Event table. Contract-level information, such as the eventNo and eventLoc, that depends only on contractNo was moved to the Contract table. The remaining Employee_Hour table

employee_hour employee PK, FK <u>eNo</u> PK <u>eNo</u> contract

PK, FK

oloyee		employee_hour	employee_hour			contract		event	
<u>eNo</u>	eName	<u>eNo</u>	<u>contractNo</u>	hours		<u>contractNo</u>	eventNo	<u>eventNo</u>	eventLoc
1135	Smith J	1135	C1024	16		C1024	H25	H25	Queens
1057	Hocine D	1057	C1024	24		C1025	H4	H4	Yonkers

<u>contractNo</u>

hours

is assigned to

C1026

PK

FK

H25

<u>contractNo</u>

eventNo

1068

White T 1068 C1025 28 1135 15 1135 C1026 10