Printing System

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Abstract:

There are a certain printers provided by a department for the printout. The is a printing system provided to manage all the printing information. Employees in the university can be categorized to two

1. Teaching staff
2. Non-Teaching staff

Teaching staff has the teachers in it, and the non-teaching staff has the following two categories:

1. Clerk
2. Delivery boy

All the above relations are not overlapping. The base table **Employee** has the details like user_id(primary key), username, email, address (composite attribute), phone number (multi-valued attribute) and salary. Further Teaching and Non teaching staff have their corresponding attributes. The employee consists of all the common or base attributes.

Teaching Staff can make a request to take the printout, along with some details like paper type, no of printouts, color, etc. The date of the request is also noted. All the above details (i.e print request details) will be stored in the **Print_req** table. At a single glance an employee can put a print request to multiple files. So, there will be an

FILE_ID stored in print_req table instead of file details. A new File table will be created and the details of the files will be stored in it as a one to many relation. Both staff and print_req are aggregated to one another. The request will be reviewed and a printout will be take by the clerk in the printout department.

The clerk can get a printout request made by a specific employee due to aggregation. After the basic validation (i.e according to the description provided by the staff), the printout will be taken and the details of them are stored in the Printout table. The cost of the printouts are also noted. There is a One to Many relation between clerk and printouts.

These printouts are set to delivery, there is a delivery boy who collects the printout along with the different staff address. This guy delivers the printout to the corresponding staff. Finally, the employees will be charged on the monthly basis. Cost after every month can be calculated and billed to the employee.

Schema:

1. Employee (Name, email, id (primary key), phone no., address, salary)
2. Staff (staff_ID (primary key), subject)
3. Clerk (clerk_ID (pk), accepted_requests)
4. File(FILEiD, files)
5. Delivery boy(del_ID(pk), no. of deliveries)
6. Print request (request_ID (primary key), staff_ID, files, date, time, type, color)
7. Printout (print_id, printout files, cost).
8. Phone(USER_ID, phone number)
9. Address(USER_ID, street, house no., state street)
10. Name(username, firstname, lastname)

11. Pincodes(pincode, city, state)

Normalisation:

0NF--

In 0NF all the attributes are written together, it has a lots of redundancy,

→ multi and composite values are not handled

→ Here printid is unique for every row, it can be served as a primary key and candidate key.

PRINTING SYSTEM TABLE

print id	st username	st email	st address	st salary	st phone numb	st id	cl username	cl email
p1	Peter John	peter@gmail.con	1233, street1, city1	55000	7894561230, 456	cl1	steve clinton	steve@gmail.cor
p2	Peter John	peter@gmail.con	1233, street1, city1	55000	7894561230, 456	cl2	krishnan	krishnan@gmail.
p3	John ahmed	john@gmail.com	123, street2, city2,	50000	1234567890	cl2	krishnan	krishnan@gmail.
p4	Rama Krishna	rama@gmail.con	13, street3, city3, p	45000	7410852963, 741	cl1	steve clinton	steve@gmail.cor
p5	Tony Thomas	tony@gmail.com	233, street4, city4,	50000	123456789	cl2	krishnan	krishnan@gmail.
p6	Robert Gray	robert@gmail.co	1231, street5, city5	40000	7895461203, 489	cl1	steve clinton	steve@gmail.cor

cl address	cl salary	cl phone numb	cl depid	cl id	db username	db email	db address	db salary
1233, street6, cit	10000	1332200556	dept1	cl1	del1	"rahul@gmail.com"	121, street11, cit	5000
233, street7, city	10000	4234567890	dept1	cl2	del1	"rahul@gmail.com"	2233, street11, c	5000
233, street7, city	10000	4234567890 ,1234567890	dept2	cl2	del2	shahil@gmail.com	1333, street1, cit	5000
1233, street6, cit	10000	1332200556	dept3	cl1	del3	shiva@gmail.com	13, street5, city6	5000
233, street7, city	10000	4234567890, 1234567890	dept4	cl2	del3	shiva@gmail.com	123, street4, city	5000
1233, street6, cit	10000	1332200556	dep5	cl1	del2	shahil@gmail.com	123, street4, city	5000

db phone numb	db id	files	file type	color	paper user	description
"7234567890, "9234567890"	del1	files1	Single side	pink	A4	question papers
"7234567890", "9234567890"	del1	files2	Double side	Blue	A3	personel printout
"9834567890"	del2	files3	Single side	pink	A3	question paper
"1234567891"	del3	files4	Double side	Black	A4	question paper
"1234567891"	del3	files5	Single side	pink	A3	answer paper
9834567890	del2	files6	Single side	Black	A3	question papers

print id	print status	printout files	cost	depname	dep HOD	fileid	date
p1	yes	file1, file2	100	CSE	Jayraj	f1	2018-11-01
p2	yes	file4, file12	200	CSE	Jayraj	f2	2018-11-10
p3	no		0	ECE	Sreeraj	f3	2018-11-18
p4	yes	file9, file0	400	EEE	Sriram	f4	2018-11-07
p5	yes	file12, file34	200	Mech	Hari	f5	2018-11-21
p6	yes		80	Civils	Sairam	f6	2018-11-06

1NF--

→ In 1NF form, Here we need to ensure that all the domains are atomic by eliminating multivalued and composite attributes.

1. New columns are added for the composite attributes.
2. New rows are added for the multivalued attributes.

In present scenario, phone numbers is multivalued, so, for every multivalued attribute, a new row is added.

Address is composite attribute, so for the contents in it like street, city, pincode etc new columns are added.

print id	st username	st email	st salary	st. Phone	st street	st city	st pincode
p1	Peter John	peter@gmail.con	55000	7894561230	Amritapuri	Kerala	690586
p1	Peter John	peter@gmail.con	55000	7894561230	Hyderebad	Telengana	690586
p2	Peter John	peter@gmail.con	55000	4569871234	Vijayawada	Andhra Pradesh	690586
p3	John ahmed	john@gmail.com	50000	1234567890	Amritapuri	Kerala	502355
p3	John ahmed	john@gmail.com	50000	7410852963	Hyderebad	Telengana	502355
p4	rama keishna	rama@gmail.con	45000	7410852963	Vijayawada	Andhra Pradesh	601021
p4	rama keishna	rama@gmail.con	45000	7419630258	Kollam	Kerala	601021
p5	tony thomas	staff4@gmail.co	50000	123456789	vallikau	Kerala	690586
p6	Robert Gray	robert@gmail.co	45000	7895461203	Kollam	Kerala	690526
p5	tony thomas	tony@gmail.com	50000	4893258741	vallikau	Kerala	690526

st h.no	st id	cl username	cl email	cl. phone	cl salary	cl id	cl h.no
1233	s1	"steve clinton"	"steve@gmail.co	7894561230	10000	cl1	1233
1233	s1	"steve clinton"	"steve@gmail.co	123456798	10000	cl1	1233
1233	s1	"steve clinton"	"steve@gmail.co	7894561230	10000	cl1	1233
123	s2	"krishnan"	"krishnan@gmail	789456131	10000	cl2	233
13	s3	"krishnan"	"krishnan@gmail	789456123	10000	cl2	1333
13	s3	"vishnu"	"krishnan1@gma	789456123	10000	cl3	1333
13	s3	"vishnu"	"krishnan1@gma	789456123	10000	cl3	1333
233	s4	"krishnan"	"krishnan@gmail	789522664	10000	cl2	23
1231	s5	"krishnan"	"krishnan@gmail	7441258963	10000	cl2	33
1231	s5	"krishnan"	"krishnan@gmail	7441258963	10000	cl2	33

cl street	cl city	cl pincode	db usernmae	db email	db salary	db id	db. phone1	db h.no
Kayankulam	Kerala	691546	del1	"rahul@gmail.co	7894561230	id11	7894561230	1456
Cochin	Kerala	690146	del1	"rahul@gmail.co	7894561230	id11	7894561230	1456
Thrivendrum	Kerala	590546	del1	"rahul@gmail.co	7894561230	id11	7894561230	1456
Kayankulam	Kerala	691546	del2	"shahil@gmail.c	789456131	id12	1234567890	2323
kayankulam	Kerala	690146	del3	"shiva@gmail.co	789456123	id13	7410852963	4343
Hyderebad	Telengana	590546	del3	"shiva@gmail.co	789456123	id13	7410852963	4343
hyderebad	Telengana	690518	del3	"shiva@gmail.co	789456123	id13	4560178293	4343
kayankulam	Kerala	690526	del2	"shahil@gmail.c	789522664	id14	123456789	2341
kayankulam	Kerala	690518	del2	"shahil@gmail.c	7441258963	id15	7895461203	2141
kayankulam	Kerala	690526	del1	"rahul@gmail.co	7441258963	id15	7895461203	2141

db street	db state	db pincode	files	file type	color	paper user	description
Hyderebad	Telengana	590546	files1	type1	color1	A4	des1
hyderebad	Telengana	690518	files1	type1	color1	A4	des1
kayankulam	Kerala	690526	files1	type1	color1	A4	des1
kayankulam	Kerala	690518	files2	type2	color2	A5	des2
kayankulam	Kerala	690526	files3	type3	color3	A3	des3
Kayankulam	Kerala	691546	files3	type3	color3	A3	des3
Cochin	Kerala	690146	files3	type3	color3	A3	des3
Thrivendrum	Kerala	590546	files4	type4	color4	A3	des4
Kayankulam	Kerala	691546	files5	type5	color5	A4	des5
kayankulam	Kerala	690146	files5	type5	color5	A4	des5

print id	print status	printout files	cost	depid	depname	fileid	fileid
1	yes	file1	100	dept1	CSE	f1	f1
1	yes	file1	100	dept1	CSE	f1	f1
1	yes	file1	100	dept2	ECE	f1	f1
2	yes	file4	200	dept2	ECE	f2	f2
3	no		0	dept3	EEE	f2	f2
3	no		0	dept3	EEE	f3	f3
3	no		0	dept1	CSE	f3	f3
4	yes	file9	400	dept1	CSE	f3	f3
5	yes	file12	200	dept1	CSE	f4	f4
5	yes	file12	200	dept1	CSE	f5	f5

2NF--

→ In 2NF all the partial dependencies have to be eliminated.

1. In present scenario, all the staff attributes like staff username, email salary etc are depending on the staff id. So, all of them are made to a single table.
2. In the similar manner, all the clerk details are depending on the clerkid, so all of them are made to a common table clerk table
3. And also the case with the delivery boy is same. All the details depending on the delivery boy are made to a common table delivery boy table.
4. All the print details a staff put, including the usedid of the staff and file type, date, color etc are stored in print req table
5. All the details after the printout, are stored in the printout table, along with the cost to each printout. And status if the printout is taken or not.

6. Username has attributes firstname and lastname, where all of them are divided to the separate User table.
7. Here, we are also considering the 4NF (i.e handling multi valued attributes). In our case phone number is made to the separate table along with the attributes id, userid and phone number.
8. Clerkid, staffid and printid can be said as unique candidate keys here in the given scenario.

staff table

st id	depid	st email	st salary	st username	st pincode	st h.no	city	state	dept name	dept hod
st1	dep1	peter@gmail.com	55000	Peter John	690586	2-2-2002	vallikau	Kerala	CSE	jayraj
st2	dep2	john@gmail.com	50000	John ahmed	502355	21-2-2	Vijayawada	Andhra Pradesh	ECE	sriraj
st3	dep2	rama@gmail.com	45000	Rama Krishna	601021	2-21-2002	Kollam	Kerala	ECE	sriraj
st4	dep3	tony@gmail.com	50000	Tony Thomas	690586	2-2-21	vallikau	Kerala	EEE	sriram
st5	dep4	robert@gmail.co	40000	Robert Gray	690526	2-12-2002	ochira	Kerala	MECH	hari

clerk table

cl id	cl username	cl email	cl salary	no. of requests	cl h.no	cl pincode	city	state
cl1	steve clinton	steve@gmail.com	10000	2	2-12-12	590546	Thrivendrum	Kerala
cl2	krishnan	krishnan@gmail.com	10000	3	12-12-12	690146	Cochin	Kerala
cl3	vishnu	krishnan1@gmail.com	10000	0	0121-12-12	601021	Kollam	Kerala

delivary boy table

db id	db username	db email	db salary	db no of deliverie	db h.no	db pincode	city	state
del1	rahul	rahul@gmail.com	5000	2	21-12-12	691546	Amritapuri	Kerala
del2	shahil	shahil@gmail.co	5000	1	12-21-12	690146	Cochin	Kerala
del3	shiva	shiva@gmail.com	5000	2	12-121-12	690526	ochira	Kerala
del4	shiva krishna	shivakrishna@gr	5000	0	112-121-12	601021	Kollam	Kerala

print req

print id	user id	file id	file type	color	paper used	description	date
p1	st1	f1	Single side	pink	A4	question papers	2018-11-01
p2	st2	f2	Double side	Blue	A3	personel printout	2018-11-10
p3	st3	f3	Single side	pink	A3	question paper	2018-11-18
p4	st4	f4	Double side	Black	A4	question paper	2018-11-07
p5	st4	f5	Single side	pink	A3	answer paper	2018-11-21
p6	st5	f6	Single side	Black	A3	question papers	2018-11-06

	printout		
print id	print status	files1	cost
p1	yes	files1	200
p2	yes	files2	100
p3	no		0
p4	yes	files3	50
p5	yes	files4	80
p6	yes	files5	120

	Validate	
print id	cl id	db boy id
p1	cl1	del1
p2	cl2	del1
p3	cl2	del2
p4	cl1	del3
p5	cl2	del3

		files
id	file id	file name
1	f1	file 1
2	f1	file 2
3	f2	file 3
4	f3	file 4
5	f4	file 5
6	f5	file 6
7	f6	file 7

	user	
username	firstname	lastname
Peter John	Peter	John
John ahmed	John	ahmed
Rama Krishna	Rama	Krishna
Tony Thomas	Tony	Thomas
Robert Gray	Robert	Gray
steve clinton	steve	clinton
rahul k	rahul	k
shahil s	shahil	s
shiva t	shiva	t
vishnu	vishnu	k
krishnan	krishnan	p
shiva krishna	shiva	krishna

	phones	
id	user_id	phone
1	st1	1234567890
2	st1	9874563210
3	st2	9632587410
4	st3	1023456789
5	st3	7563214890
6	st4	1597648305
7	st5	7755663322
8	cl1	1332200556
9	cl2	4234567890
10	cl2	1234567890
11	db1	7234567890
12	db1	9234567890
13	db2	9834567890
14	db3	1234567891

3NF--

→ In this case the transitive dependency is checked, If any non prime attribute is deriving an another non prime attribute then we can say it as transitive dependency.

1. In staff table department name and HOD are dependent on department Id. So, all of them are separated to another table.
2. Also, the pincode identifies the location uniquely. So, each state and city combinedly has a pincode. Hence, pincode, state and city are sperated to a another table.

staff table

st id	depid	st email	st salary	st username	st pincode	st h.no
st1	dep1	peter@gmail.com	55000	Peter John	690586	2-2-2002
st2	dep2	john@gmail.com	50000	John ahmed	502355	21-2-2
st3	dep2	rama@gmail.com	45000	Rama Krishna	601021	2-21-2002
st4	dep3	tony@gmail.com	50000	Tony Thomas	690586	2-2-21
st5	dep4	robert@gmail.co	40000	Robert Gray	690526	2-12-2002

clerk table

cl id	cl username	cl email	cl salary	no. of requests	cl h.no	cl pincode
cl1	steve clinton	steve@gmail.co	10000	2	2-12-12	590546
cl2	krishnan	krishnan@gmail.	10000	3	12-12-12	690146
cl3	vishnu	krishnan1@gmai	10000	0	0121-12-12	601021

delivary boy table

db id	db username	db email	db salary	db no of deliverie	db h.no	db pincode
del1	rahul	rahul@gmail.com	5000	2	21-12-12	691546
del2	shahil	shahil@gmail.co	5000	1	12-21-12	690146
del3	shiva	shiva@gmail.com	5000	2	12-121-12	690526
del4	shiva krishna	shivakrishna@gr	5000	0	112-121-12	601021

printout

print id	print status	files1	cost
p1	yes	files1	200
p2	yes	files2	100
p3	no		0
p4	yes	files3	50
p5	yes	files4	80
p6	yes	files5	120

print req

print id	user id	file id	file type	color	paper used	description	date
p1	st1	f1	Single side	pink	A4	question papers	2018-11-01
p2	st2	f2	Double side	Blue	A3	personel printout	2018-11-10
p3	st3	f3	Single side	pink	A3	question paper	2018-11-18
p4	st4	f4	Double side	Black	A4	question paper	2018-11-07
p5	st4	f5	Single side	pink	A3	answer paper	2018-11-21
p6	st5	f6	Single side	Black	A3	question papers	2018-11-06

Validate

print id	cl id	db boy id
p1	cl1	del1
p2	cl2	del1
p3	cl2	del2
p4	cl1	del3
p5	cl2	del3

Department

depid	depname	dep hod
dept1	CSE	Jayraj
dept2	ECE	Sreeraj
dept3	EEE	Sriram
dept4	Mech	Hari
dep5	Civils	Sairam

		files
id	file id	file name
1	f1	file 1
2	f1	file 2
3	f2	file 3
4	f3	file 4
5	f4	file 5
6	f5	file 6
7	f6	file 7

PIncodes		
pincode	st state	st city
690546	Amritapuri	Kerala
500003	Hyderebad	Telengana
502355	Vijayawada	Andhra Pradesh
601021	Kollam	Kerala
690586	vallikau	Kerala
690518	karunapally	Kerala
690526	ochira	Kerala
691546	Kayankulam	Kerala
690146	Cochin	Kerala
590546	Thrivendrum	Kerala

	phones	
id	user_id	phone
1	st1	1234567890
2	st1	9874563210
3	st2	9632587410
4	st3	1023456789
5	st3	7563214890
6	st4	1597648305
7	st5	7755663322
8	cl1	1332200556
9	cl2	4234567890
10	cl2	1234567890
11	db1	7234567890
12	db1	9234567890
13	db2	9834567890
14	db3	1234567891

	user	
username	firstname	lastname
Peter John	Peter	John
John ahmed	John	ahmed
Rama Krishna	Rama	Krishna
Tony Thomas	Tony	Thomas
Robert Gray	Robert	Gray
steve clinton	steve	clinton
rahul k	rahul	k
shahil s	shahil	s
shiva t	shiva	t
vishnu	vishnu	k
krishnan	krishnan	p
shiva krishna	shiva	krishna

SQL Queries:

→ select department_id, count(staff_id) as dep_staff from staff group by department_id having count(staff_id) > 0;

department_id character varying(20)	dep_staff bigint
dep3	1
dep4	1
dep2	2
dep1	1

→ select print_req.user_id, sum(cost) from printout inner join print_req on printout.print_id = print_req.print_id group by user_id;

user_id character varying(30)	sum bigint
st4	130
st3	0
st5	120
st1	200
st2	100

→ select * from staff order by salary desc;

staff_id character varying(20)	department_id character varying(20)	email character varying(50)	salary integer	username character varying(80)	pincode character varying(20)	house_no character varying(20)
st1	dep1	peter@gmail.com	55000	Peter John	690586	2-2-2
st2	dep2	john@gmail.com	50000	John ahmed	502355	21-2-2
st4	dep3	tony@gmail.com	50000	Tony Thomas	690586	2-2-21
st3	dep2	rama@gmail.com	45000	Rama Krishna	601021	2-21-2
st5	dep4	robert@gmail.com	40000	Robert Gray	690526	2-12-2

→ select * from print_req order by date1;

print_id character varying(30)	user_id character varying(30)	file_id character varying(30)	file_type character varying(20)	color character varying(20)	paper_used character varying(20)	description character varying(20)	date1 date
p1	st1	f1	Single side	pink	A4	question papers	2018-11-01
p6	st5	f6	Single side	Black	A3	question papers	2018-11-06
p4	st4	f4	Double side	Black	A4	question paper	2018-11-07
p2	st2	f2	Double side	Blue	A3	personel printout	2018-11-10
p3	st3	f3	Single side	pink	A3	question paper	2018-11-18
p5	st4	f5	Single side	pink	A3	answer paper	2018-11-21

→ select staff.staff_id, staff.username, print_req.print_id from staff inner join print_req on staff.staff_id = print_req.user_id;

staff_id character varying(20)	username character varying(80)	print_id character varying(30)
st1	Peter John	p1
st2	John ahmed	p2
st3	Rama Krishna	p3
st4	Tony Thomas	p4
st4	Tony Thomas	p5
st5	Robert Gray	p6

→ select clerk.username, validates.print_id from Clerk full outer join validates on clerk.clerk_id = validates.clerk_id;

username character varying(80)	print_id character varying(30)
steve clinton	p1
krishnan	p2
krishnan	p3
steve clinton	p4
krishnan	p5
vishnu	

→ select * from staff where salary > 45000 and pincode = '502355';

staff_id character varying(20)	department_id character varying(20)	email character varying(50)	salary integer	username character varying(80)	pincode character varying(20)	house_no character varying(20)
st2	dep2	john@gmail.com	50000	John ahmed	502355	21-2-2

→ select username, (salary + salary/100) from staff;

username character varying(80)	?column? integer
Peter John	55550
John ahmed	50500
Rama Krishna	45450
Tony Thomas	50500
Robert Gray	40400

→ select * from user1 where firstname like '%a%';

username character varying(80)	firstname character varying(40)	lastname character varying(40)
Rama Krishna	Rama	Krishna
rahul k	rahul	k
shahil s	shahil	s
shiva t	shiva	t
krishnan	krishnan	p
shiva krishna	shiva	krishna

→ select firstname, lastname from user1 where username = (select username from staff where salary=55000);

firstname character varying(40)	lastname character varying(40)
steve	clinton
vishnu	k
krishnan	p

→ select * from clerk where exists (select * from validates where clerk.clerk_id = validates.clerk_id);

lerk_id haracter varying(20)	email character varying(50)	salary integer	username character varying(80)	pincode character varying(20)	house_no character varying(20)	printouts character varying(50)
l1	steve@gmail.com	10000	steve clinton	590546	2-12-12	2
l2	krishnan@gmail.com	10000	krishnan	690146	12-12-12	3

→ select * from delivary_boy where db_id = any (select db_id from validates);

db_id :haracter varying(20)	email character varying(50)	salary integer	username character varying(80)	pincode character varying(20)	house_no character varying(20)	deliveries character varying(50)
del1	rahul@gmail.com	5000	rahul	691546	21-12-12	2
del2	shahil@gmail.com	5000	shahil	690146	12-21-12	1
del3	shiva@gmail.com	5000	shiva	690526	12-121-12	2

→ select db_id from delivary_boy INTERSECT select db_id from validates;

db_id character varying
del1
del2
del3

→ select * from staff where salary between 40000 and 50000;

staff_id character varying(20)	department_id character varying(20)	email character varying(50)	salary integer	username character varying(80)	pincode character varying(20)	house_no character varying(20)
st2	dep2	john@gmail.com	50000	John ahmed	502355	21-2-2
st3	dep2	rama@gmail.com	45000	Rama Krishna	601021	2-21-2
st4	dep3	tony@gmail.com	50000	Tony Thomas	690586	2-2-21
st5	dep4	robert@gmail.com	40000	Robert Gray	690526	2-12-2

→ select * from delivary_boy where db_id not in ('del1', 'del3');

db_id character varying(20)	email character varying(50)	salary integer	username character varying(80)	pincode character varying(20)	house_no character varying(20)	deliveries character varying(50)
del2	shahil@gmail.com	5000	shahil	690146	12-21-12	1
del4	shivakrishna@gmail.com	5000	shiva krishna	601021	112-121-12	0

→ select username, to_char(salary, 'FM9999999999') as salary from staff;

username character varying(80)	salary text
Peter John	55000
John ahmed	50000
Rama Krishna	45000
Tony Thomas	50000
Robert Gray	40000

→ select print_id, extract(day from date1) as date_of_request from print_req;

print_id character varying(30)	date_of_request double precision
p1	1
p2	10
p3	18
p4	7
p5	21
p6	6