A woman with long brown hair and glasses is sitting at a wooden table in a bright, modern office or library. She is wearing a brown leather jacket over a blue patterned scarf. She is holding a black smartphone to her ear with her left hand and looking down at a large open book or portfolio on the table with her right hand. In the background, another person is sitting at a table, and the room has large windows and white walls.

Razvoj baze podataka za sistem upravljanja bankovnim računima

Luka Rakić
Andrija Tasić

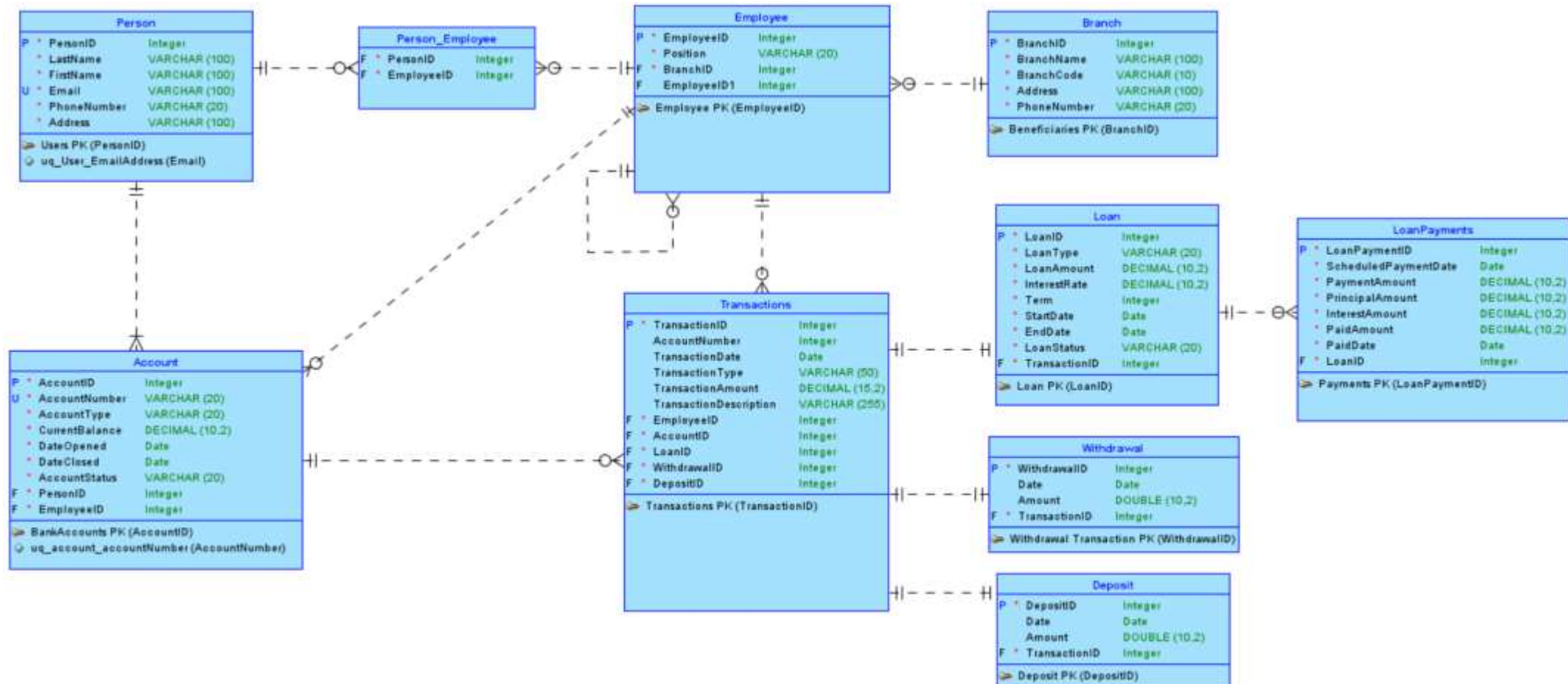
Sadržaj

- Opis projekta
- Entity-Relationship Diagram (ERD)
- Relacioni model
- Tipovi veza između entiteta
- CRUD analiza
- Uzorak podataka (izgled popunjene tabele PERSON)
- Projekat u APEX-u (upiti, mapiranje tabela ...)
- Funkcionalnosti projekta
- Zaključak

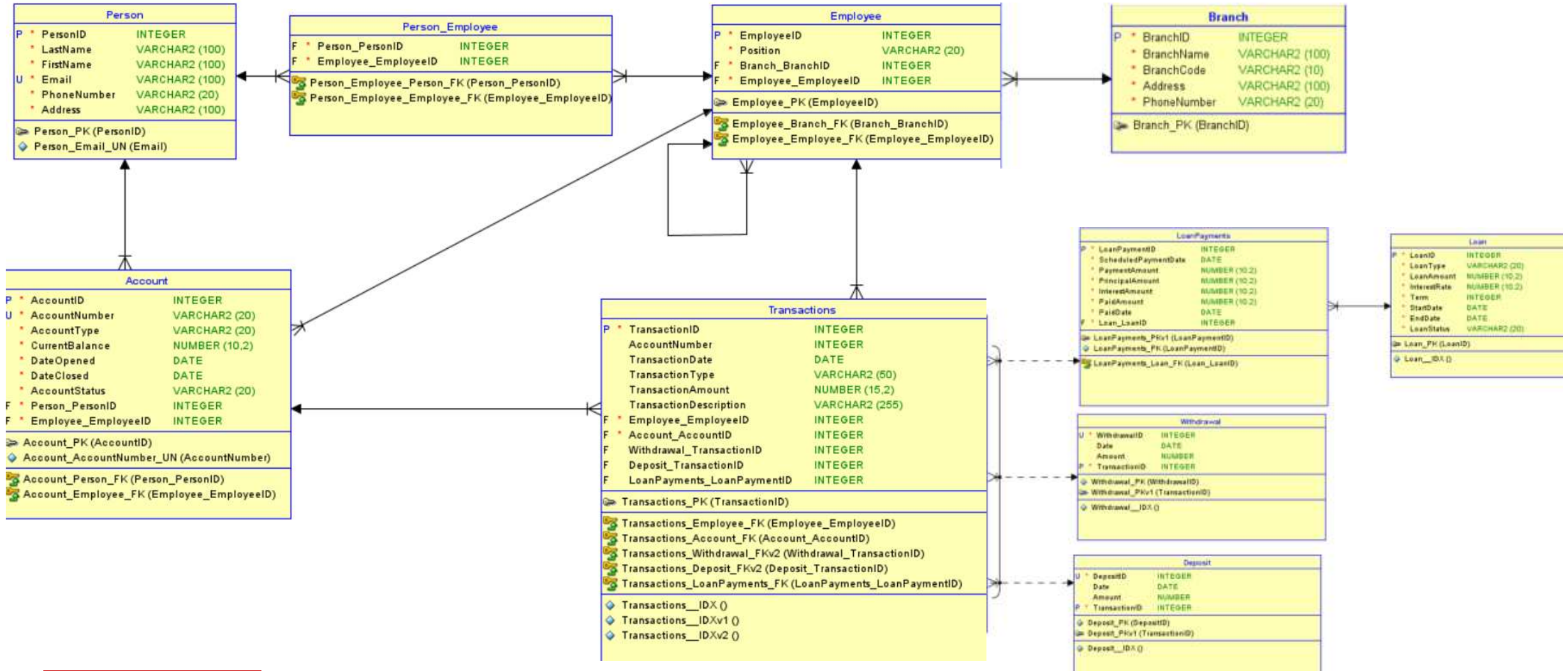
Opis projekta

- **Cilj projekta:** Efikasno upravljanje korisničkim računima u bankarskom sistemu.
- **Uloga zaposlenih:** Povezivanje zaposlenih sa korisnicima radi personalizovane usluge.
- **Transakcije:** Praćenje uplata, isplata, transfera i otplata kredita.
- **Saldo:** Ažuriranje salda u realnom vremenu nakon svake transakcije.
- **Pregled:** Prikaz istorije transakcija i statusa kredita za svakog korisnika.
- **Bezbednost podataka:** Održavanje sigurnosti i zaštite ličnih i finansijskih informacija korisnika.

Entity-Relationship Diagram (ERD)

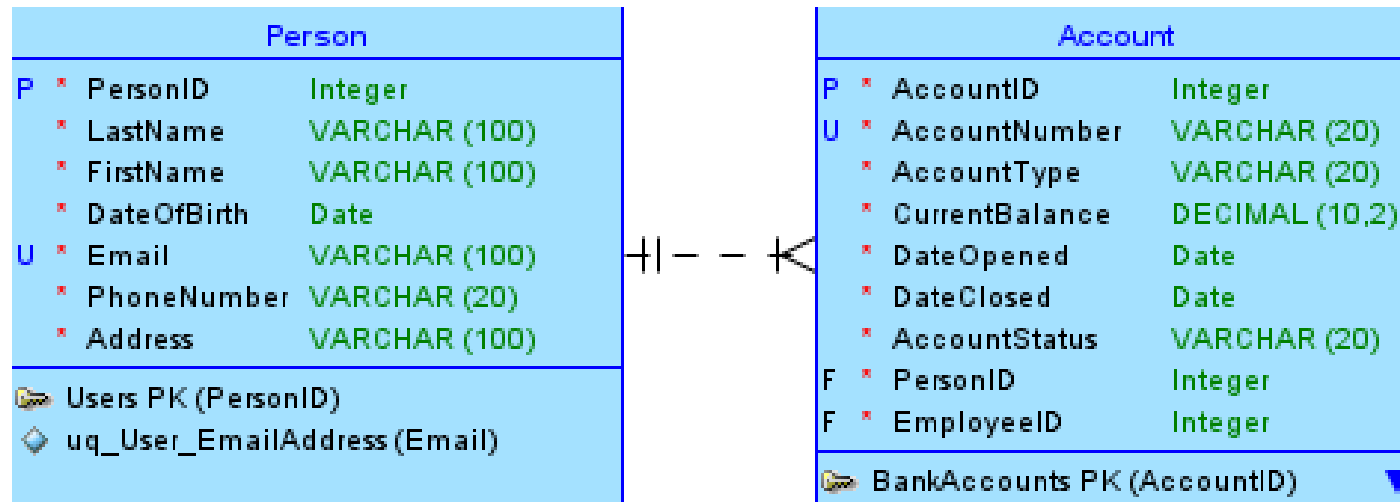


Relazioni model



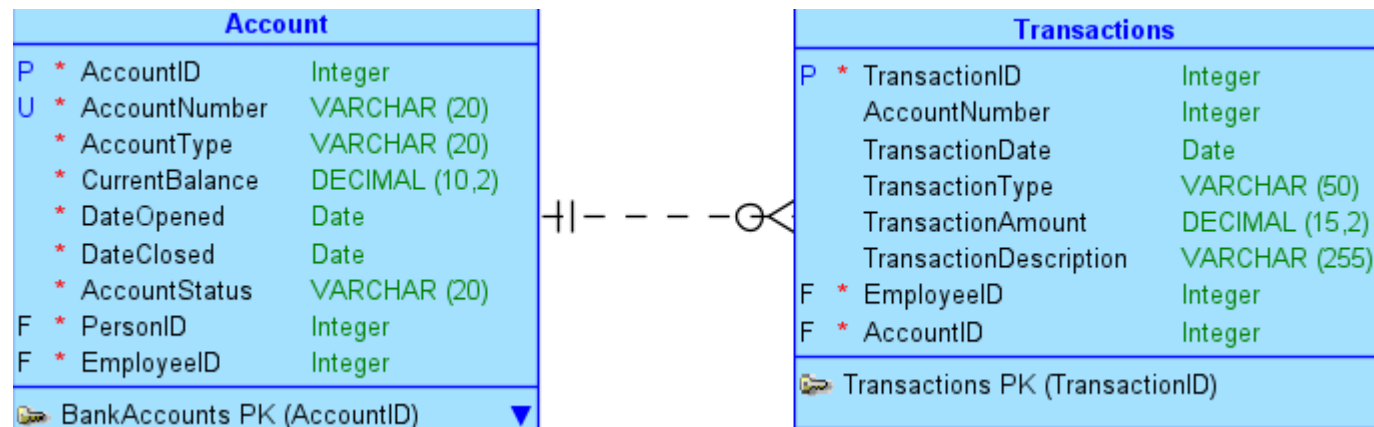
Tipovi veza izmedju entiteta

- **Veza između “Person” i “Account” entiteta:**
- Svaka osoba može imati više računa, ali svaki račun pripada samo jednoj osobi. Ovo je primer “jedan prema više” veze.



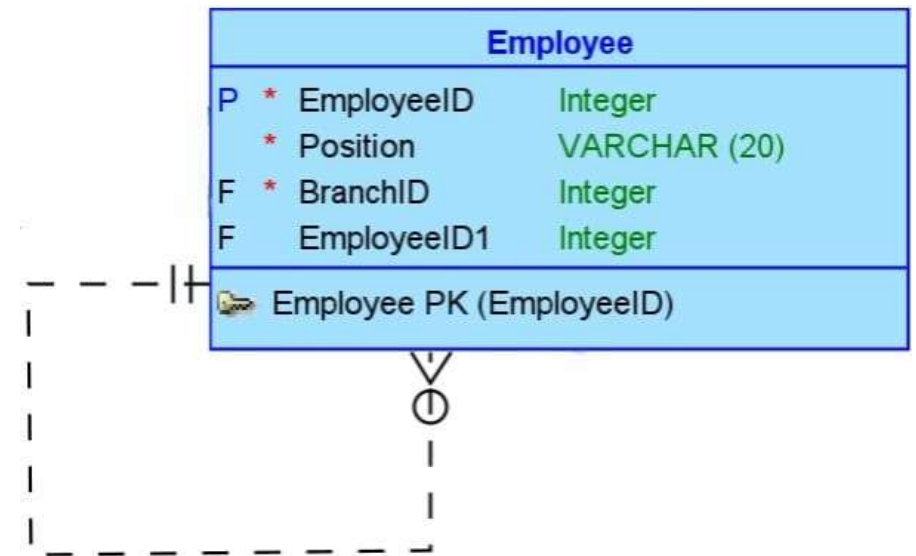
Tipovi veza izmedju entiteta

- **Veza između “Account” i “Transaction” entiteta:**
- Svaki račun može imati više transakcija, dok svaka pojedinačna transakcija pripada samo jednom računu. Ovo je još jedan primer “1:N” veze.



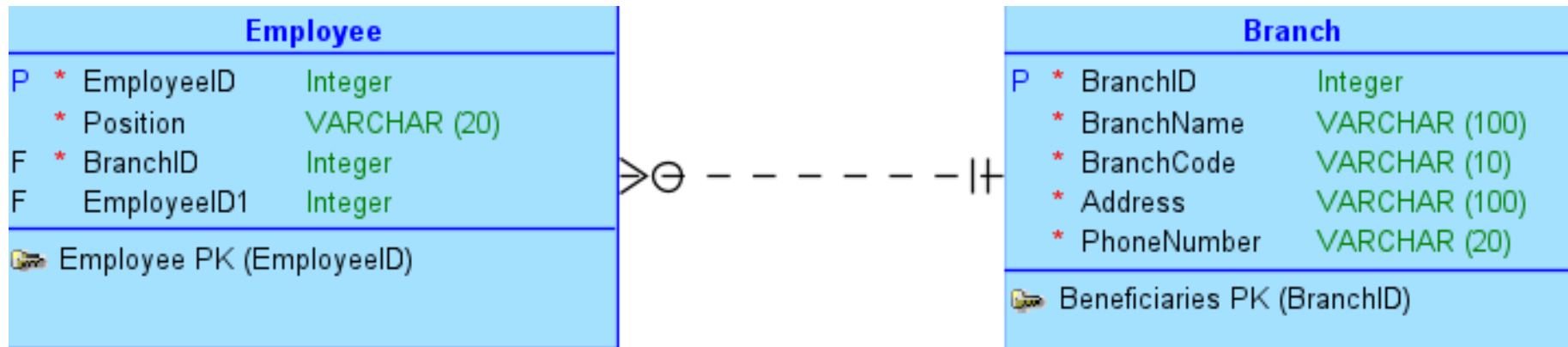
Tipovi veza izmedju entiteta

- **Rekurzivna veza entiteta “Employee”:**
- Omogućava da jedan zaposleni bude nadređeni drugom zaposlenom, dok istovremeno može imati podređene zaposlene. Na primer, menadžer može imati više podređenih, dok svaki podređeni takođe može biti menadžer drugih zaposlenih.



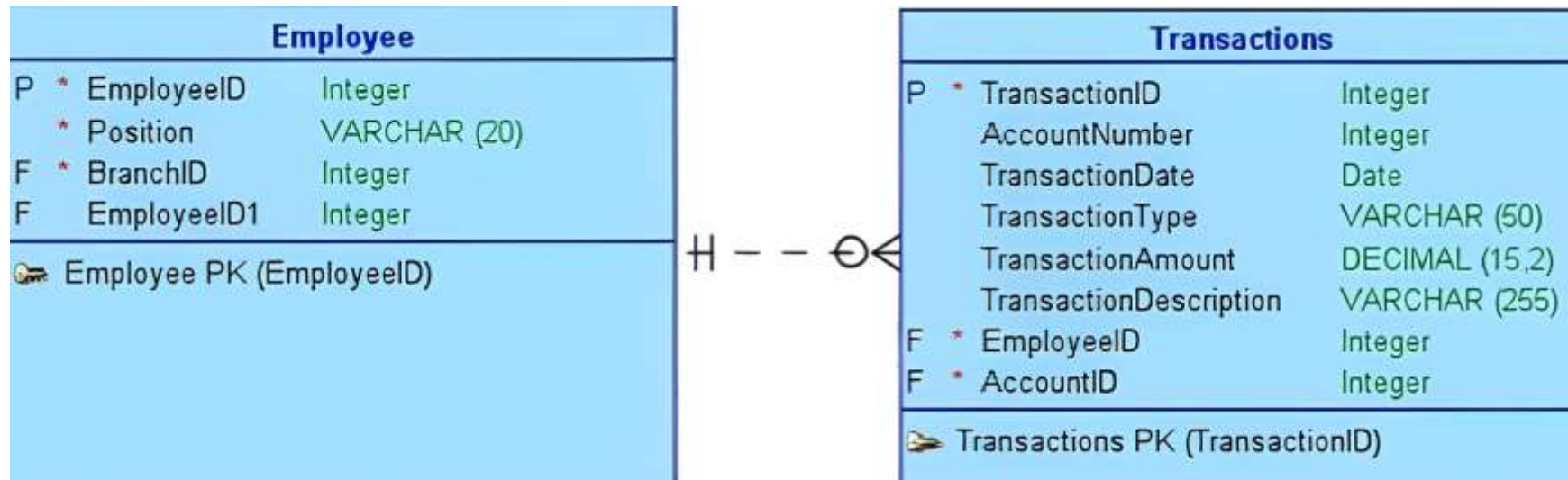
Tipovi veza izmedju entiteta

- **Veza između “Employee” i “Branch”:**
- Odnos “jedan prema više” (1:N).
- Svaki zaposleni pripada samo jednoj filijali, a svaka filijala ima više zaposlenih.



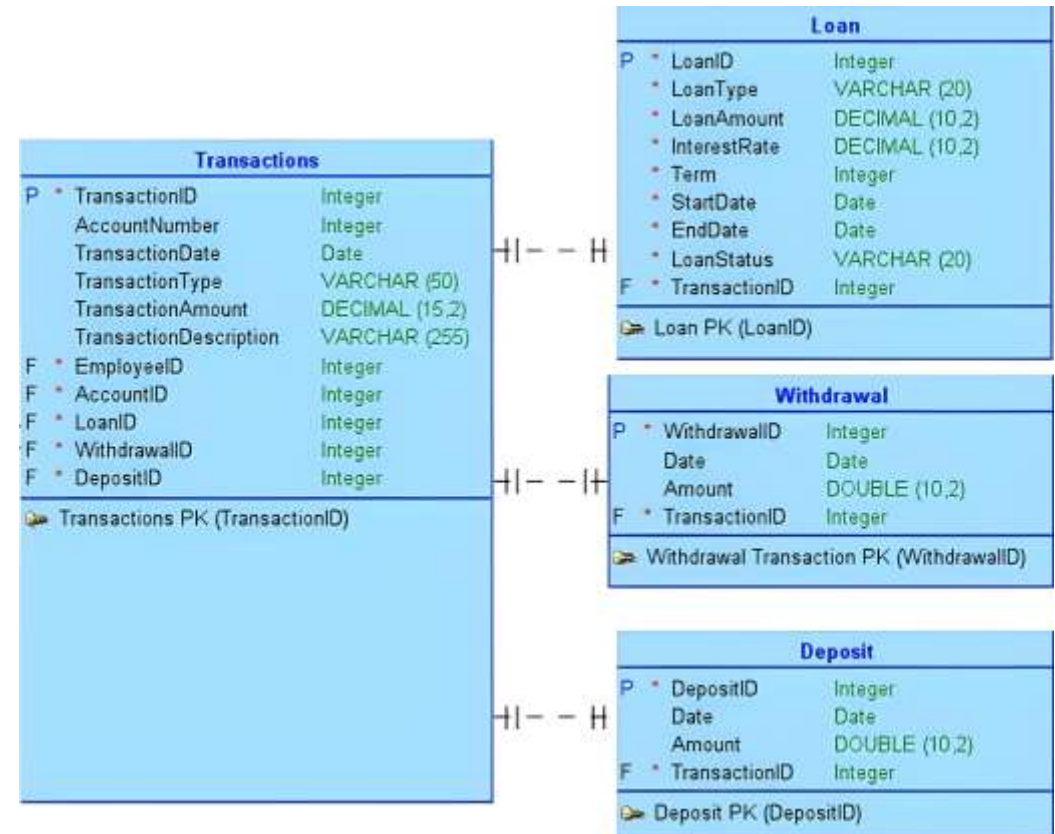
Tipovi veza izmedju entiteta

- **Veza između “Employee” i “Transaction”:**
- Odnos “jedan prema više” (1:N).
- Svaki zaposleni može da ima više transakcija, dok svaka transakcija može da ima samo jednog zaposlenog.



Tipovi veza izmedju entiteta
















- Arch veza između Transaction i Deposit, Withdrawal i Loan:
- S obzirom da transakcije mogu biti u vidu depozita (**Deposit**), povlačenja novca sa računa (**Withdrawal**) - (npr. Isplata sa bankomata ili podizanje sa kartice) i pozajmice (**Loan**) - kredita tip veze koja je formirana je arch.



CRUD ANALIZA

CRUD	OBJEKAT: PERSON
C	* Prilikom prvog pravljenja racuna u banci
R	* Podaci o klijentu
U	*Promena podataka o klijentu
D	*Brisanje racuna usled ilegalnih radnji i prevara

Uzorak podataka (izgled popunjene tabele PERSON)

PERSON							+ v
EDIT	PERSONID	LASTNAME	FIRSTNAME	EMAIL	PHONENUMBER	ADDRESS	
	1	Smith	John	john.smith@example.com	123-456-7890	123 Main St	
	2	Johnson	Emily	emily.johnson@example.com	234-567-8901	456 Elm St	
	3	Williams	Michael	michael.williams@example.com	345-678-9012	789 Oak St	
	4	Brown	Sarah	sarah.brown@example.com	456-789-0123	987 Pine St	
	5	Jones	David	david.jones@example.com	567-890-1234	654 Cedar St	
	6	Miller	Jessica	jessica.miller@example.com	678-901-2345	321 Maple St	
	7	Davis	Matthew	matthew.davis@example.com	789-012-3456	159 Birch St	
	8	Garcia	Jennifer	jennifer.garcia@example.com	890-123-4567	357 Walnut St	
	9	Rodriguez	Daniel	daniel.rodriguez@example.com	901-234-5678	753 Spruce St	
	10	Martinez	Amanda	amanda.martinez@example.com	012-345-6789	1590 Cherry St	
	11	Hernandez	Christopher	christopher.hernandez@example.com	987-654-3210	2467 Pineapple St	
	12	Lopez	Ashley	ashley.lopez@example.com	876-543-2109	864 Grape St	
	13	Gonzalez	Brian	brian.gonzalez@example.com	765-432-1098	753 Orange St	
	14	Wilson	Melissa	melissa.wilson@example.com	654-321-0987	159 Lemon St	
	15	Anderson	Kevin	kevin.anderson@example.com	543-210-9876	753 Lime St	

Projekat u APEX-u

- Kreiranje tabele (DDL – Data Definition Language)

```
CREATE TABLE "ACCOUNT"  
(  
  "ACCOUNTID" NUMBER(*,0) NOT NULL ENABLE,  
  "ACCOUNTNUMBER" VARCHAR2(20) COLLATE "USING_NLS_COMP" NOT NULL ENABLE,  
  "ACCOUNTTYPE" VARCHAR2(20) COLLATE "USING_NLS_COMP" NOT NULL ENABLE,  
  "CURRENTBALANCE" NUMBER(10,2) NOT NULL ENABLE,  
  "DATEOPENED" DATE NOT NULL ENABLE,  
  "DATECLOSED" DATE NOT NULL ENABLE,  
  "ACCOUNTSTATUS" VARCHAR2(20) COLLATE "USING_NLS_COMP" NOT NULL ENABLE,  
  "PERSON_PERSONID" NUMBER(*,0) NOT NULL ENABLE,  
  "EMPLOYEE_EMPLOYEEID" NUMBER(*,0) NOT NULL ENABLE,  
  CONSTRAINT "ACCOUNT_PK" PRIMARY KEY ("ACCOUNTID")  
  USING INDEX ENABLE,  
  CONSTRAINT "ACCOUNT_ACCOUNTNUMBER_UN" UNIQUE ("ACCOUNTNUMBER")  
  USING INDEX ENABLE  
  ) DEFAULT COLLATION "USING_NLS_COMP"  
/  
ALTER TABLE "ACCOUNT" ADD CONSTRAINT "ACCOUNT_EMPLOYEE_FK" FOREIGN KEY ("EMPLOYEE_EMPLOYEEID")  
  REFERENCES "EMPLOYEE" ("EMPLOYEEID") ENABLE  
/  
ALTER TABLE "ACCOUNT" ADD CONSTRAINT "ACCOUNT_PERSON_FK" FOREIGN KEY ("PERSON_PERSONID")  
  REFERENCES "PERSON" ("PERSONID") ENABLE  
/  
/
```

```
CREATE TABLE "BRANCH"  
(  
  "BRANCHID" NUMBER(*,0) NOT NULL ENABLE,  
  "BRANCHNAME" VARCHAR2(100) COLLATE "USING_NLS_COMP" NOT NULL ENABLE,  
  "BRANCHCODE" VARCHAR2(10) COLLATE "USING_NLS_COMP" NOT NULL ENABLE,  
  "ADDRESS" VARCHAR2(100) COLLATE "USING_NLS_COMP" NOT NULL ENABLE,  
  "PHONENUMBER" VARCHAR2(20) COLLATE "USING_NLS_COMP" NOT NULL ENABLE,  
  CONSTRAINT "BRANCH_PK" PRIMARY KEY ("BRANCHID")  
  USING INDEX ENABLE  
  ) DEFAULT COLLATION "USING_NLS_COMP"  
/  
/
```


Projekat u APEX-u

- Kreiranje tabele (DDL – Data Definition Language)

```
CREATE TABLE "TRANSACTIONS"  
(  
  "TRANSACTIONID" NUMBER(*,0) NOT NULL ENABLE,  
  "ACCOUNTNUMBER" NUMBER(*,0),  
  "TRANSACTIONDATE" DATE,  
  "TRANSACTIONTYPE" VARCHAR2(50) COLLATE "USING_NLS_COMP",  
  "TRANSACTIONAMOUNT" NUMBER(15,2),  
  "TRANSACTIONDESCRIPTION" VARCHAR2(255) COLLATE "USING_NLS_COMP",  
  "EMPLOYEE_EMPLOYEEID" NUMBER(*,0) NOT NULL ENABLE,  
  "ACCOUNT_ACCOUNTID" NUMBER(*,0) NOT NULL ENABLE,  
  CONSTRAINT "TRANSACTIONS_PK" PRIMARY KEY ("TRANSACTIONID")  
  USING INDEX ENABLE  
  ) DEFAULT COLLATION "USING_NLS_COMP"  
/  
ALTER TABLE "TRANSACTIONS" ADD CONSTRAINT "TRANSACTIONS_ACCOUNT_FK" FOREIGN KEY ("ACCOUNT_ACCOUNTID")  
  REFERENCES "ACCOUNT" ("ACCOUNTID") ENABLE  
/  
ALTER TABLE "TRANSACTIONS" ADD CONSTRAINT "TRANSACTIONS_EMPLOYEE_FK" FOREIGN KEY ("EMPLOYEE_EMPLOYEEID")  
  REFERENCES "EMPLOYEE" ("EMPLOYEEID") ENABLE  
/
```

```
CREATE TABLE "BRANCH"  
(  
  "BRANCHID" NUMBER(*,0) NOT NULL ENABLE,  
  "BRANCHNAME" VARCHAR2(100) COLLATE "USING_NLS_COMP" NOT NULL ENABLE,  
  "BRANCHCODE" VARCHAR2(10) COLLATE "USING_NLS_COMP" NOT NULL ENABLE,  
  "ADDRESS" VARCHAR2(100) COLLATE "USING_NLS_COMP" NOT NULL ENABLE,  
  "PHONENUMBER" VARCHAR2(20) COLLATE "USING_NLS_COMP" NOT NULL ENABLE,  
  CONSTRAINT "BRANCH_PK" PRIMARY KEY ("BRANCHID")  
  USING INDEX ENABLE  
  ) DEFAULT COLLATION "USING_NLS_COMP"  
/
```

Mapiranje tabela

Person		
PK	*	PersonID
	*	LastName
	*	FirstName
UQ	*	Email
	*	PhoneNumber
	*	Address

Account		
PK	*	AccountID
UQ	*	AccountNumber
	*	AccountType
	*	CurrentBalance
	*	DateOpened
	*	DateClosed
	*	AccountStatus
FK	*	PersonID
FK	*	EmployeeID

Person_Employee		
FK	*	PersonID
FK	*	EmployeeID

Deposit		
PK	*	DepositID
	*	Date
	*	Amount
FK	*	TransactionID

Withdrawal		
PK	*	WithdrawalID
	*	Date
	*	Amount
FK	*	TransactionID

Loan		
PK	*	LoanID
UQ	*	LoanType
	*	LoanAmount
	*	InterestRate
	*	Term
	*	StartDate
	*	EndDate
	*	LoanStatus
FK	*	TransactionID

Employee		
PK	*	EmployeeID
	*	Position
FK	*	BranchID
FK	*	EmployeeID1

Transactions		
PK	*	TransactionID
	*	AccountNumber
	*	TransactionDate
	*	TransactionType
	*	TransactionAmount
	*	TransactionDescription
FK	*	EmployeeID
FK	*	AccountID

Branch		
PK	*	BranchID
	*	Branchname
	*	BranchCode
	*	Address
	*	PhoneNumber

LoanPayment		
PK	*	LoanPaymentID
	*	ScheduledPaymentDate
	*	PaymentAmount
	*	PrincipalAmount
	*	InterestAmount
	*	PaidAmount
	*	PaidDate
FK	*	LoanID

Izgled forme entiteta PERSON:

ProjectForm

Person_ID

Firstname

Phonenumber

Address

Cancel

Create

UPITI

- Upit

```
SELECT *  
FROM person  
WHERE LENGTH(FIRSTNAME) > 5 AND EMAIL LIKE '%example.com%'  
ORDER BY LASTNAME DESC;
```

- Rezultat upita

PERSONID	LASTNAME	FIRSTNAME	EMAIL	PHONENUMBER	ADDRESS
14	Wilson	Melissa	melissa.wilson@example.com	654-321-0987	150 Lemon St.
3	Williams	Michael	michael.williams@example.com	345-678-9012	789 Oak St.
20	White	Michelle	michelle.white@example.com	098-765-4321	567 Papaya St.
16	Thomas	Rachel	rachel.thomas@example.com	432-109-8765	987 Banana St.
9	Rodriguez	Daniel	daniel.rodriguez@example.com	901-234-5678	753 Spruce St.
18	Moore	Nicole	nicole.moore@example.com	210-987-6543	159 Plum St.
6	Miller	Jessica	jessica.miller@example.com	678-901-2345	321 Maple St.
10	Martinez	Amanda	amanda.martinez@example.com	012-345-6789	1590 Cherry St.
12	Lopez	Ashley	ashley.lopez@example.com	876-543-2109	864 Grape St.
19	Jackson	Brandon	brandon.jackson@example.com	109-876-5432	753 Avocado St.

UPITI

- Upit

```
SELECT LastName || ', ' || FirstName AS FullName, Email
FROM person
WHERE Address LIKE '%Pine%' OR Address LIKE '%Main%'
ORDER BY LastName;
```

- Rezultat upita

FULLNAME	EMAIL
Brown, Sarah	sarah.brown@example.com
Hernandez, Christopher	christopher.hernandez@example.com
Smith, John	john.smith@example.com

UPITI

- Upit

```
SELECT SUBSTR(LastName, 1, 1) AS InitialLetter, COUNT(*) AS Count
FROM person
WHERE Email LIKE '%@example.com'
GROUP BY SUBSTR(LastName, 1, 1)
ORDER BY InitialLetter;
```

- Rezultat upita

INITIALLETTER	COUNT
A	1
B	1
D	1
G	2
H	1
J	3
L	1
M	3
R	1

UPITI

- Upit

```
SELECT BranchName, Address
FROM branch
WHERE SUBSTR(PhoneNumber, 1, 3) = (
    SELECT SUBSTR(PhoneNumber, 1, 3)
    FROM branch
    WHERE BranchName = 'Main Branch'
);
```

- Rezultat upita

BRANCHNAME	ADDRESS
Main Branch	123 Main St

UPITI

- Upit

```
SELECT BranchName, PhoneNumber
FROM branch
WHERE SUBSTR(PhoneNumber, 1, 3) IN (
  SELECT PhonePrefix
  FROM (
    SELECT SUBSTR(PhoneNumber, 1, 3) AS PhonePrefix, COUNT(*) AS PrefixCount
    FROM branch
    GROUP BY SUBSTR(PhoneNumber, 1, 3)
  )
  WHERE PrefixCount = 1
);
```

- Rezultat upita

BRANCHNAME	PHONENUMBER
Westside Branch	345-678-9012
Island Branch	210-987-6543
Uptown Branch	789-012-3456
Hilltop Branch	901-234-5678
Harbor Branch	543-210-9876
Main Branch	123-456-7890
Downtown Branch	234-567-8901
Northside Branch	567-890-1234
Valley Branch	012-345-6789

Kreiranje formi i izveštaja

ProjectReport

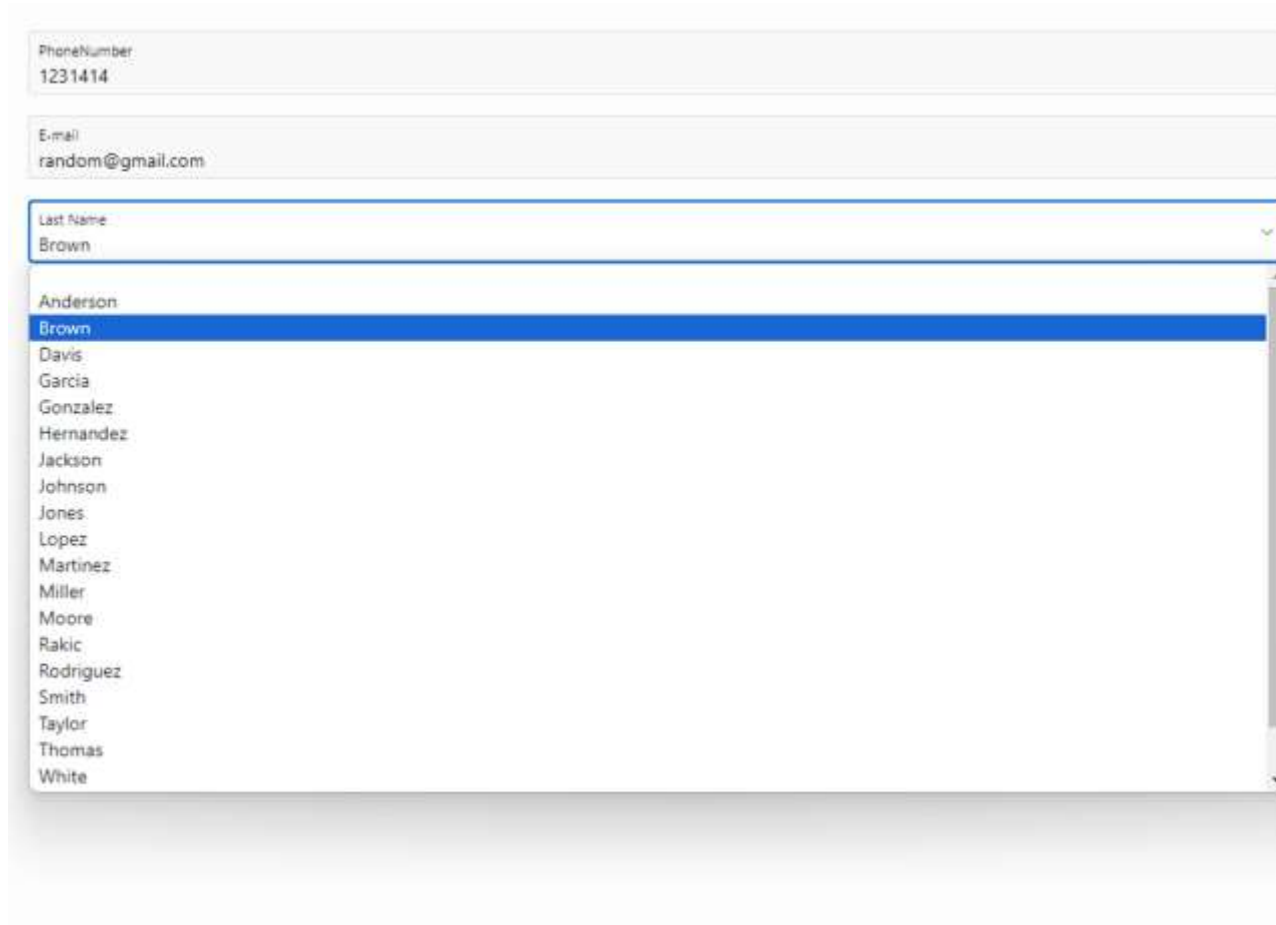
Q

Go

Actions

Lastname	Firstname	Email	Phonenumber	Address
Rakic	Luka	lukarakic00@gmail.com	1234	Kostica
Smith	John	john.smith@example.com	123-456-7890	123 Main St
Johnson	Emily	emily.johnson@example.com	234-567-8901	456 Elm St
Williams	Michael	michael.williams@example.com	345-678-9012	789 Oak St
Brown	Sarah	sarah.brown@example.com	456-789-0123	987 Pine St
Jones	David	david.jones@example.com	567-890-1234	654 Cedar St
Miller	Jessica	jessica.miller@example.com	678-901-2345	321 Maple St
Davis	Matthew	matthew.davis@example.com	789-012-3456	159 Birch St
Garcia	Jennifer	jennifer.garcia@example.com	890-123-4567	357 Walnut St
Rodriguez	Daniel	daniel.rodriguez@example.com	901-234-5678	753 Spruce St
Martinez	Amanda	amanda.martinez@example.com	012-345-6789	1590 Cherry St
Hernandez	Christopher	christopher.hernandez@example.com	987-654-3210	2467 Pineapple St
Lopez	Ashley	ashley.lopez@example.com	876-543-2109	864 Grape St
Gonzalez	Brian	brian.gonzalez@example.com	765-432-1098	753 Orange St
Wilson	Melissa	melissa.wilson@example.com	654-321-0987	159 Lemon St
Anderson	Kevin	kevin.anderson@example.com	543-210-9876	753 Lime St
Thomas	Rachel	rachel.thomas@example.com	432-109-8765	987 Banana St

Dodavanje liste vrednosti (list of values LOV)



The screenshot displays a web form with three input fields. The first field, labeled 'PhoneNumber', contains the value '1231414'. The second field, labeled 'E-mail', contains the value 'random@gmail.com'. The third field, labeled 'Last Name', is a dropdown menu currently showing 'Brown'. Below the dropdown, a list of names is visible, with 'Brown' highlighted in blue. The list includes: Anderson, Brown, Davis, Garcia, Gonzalez, Hernandez, Jackson, Johnson, Jones, Lopez, Martinez, Miller, Moore, Rakic, Rodriguez, Smith, Taylor, Thomas, and White.

Field Label	Value
PhoneNumber	1231414
E-mail	random@gmail.com
Last Name	Brown

- Anderson
- Brown**
- Davis
- Garcia
- Gonzalez
- Hernandez
- Jackson
- Johnson
- Jones
- Lopez
- Martinez
- Miller
- Moore
- Rakic
- Rodriguez
- Smith
- Taylor
- Thomas
- White

Funkcionalnosti projekta

- **Centralizacija podataka:** Svi podaci o klijentima, zaposlenima, računima, transakcijama, kreditima i filijalama su organizovani i centralizovani na jednom mestu.
- **Praćenje i upravljanje računima:** Omogućava jednostavno praćenje i upravljanje različitim vrstama bankovnih računa, uključujući detalje o balansu, statusu i istoriji transakcija.
- **Evidencija transakcija:** Svi detalji o transakcijama (uplate, isplate) su jasno zabeleženi, što omogućava bolju kontrolu i pregled finansijskih tokova.

Funkcionalnosti projekta

- **Upravljanje kreditima:** Omogućava praćenje svih aspekata kredita, uključujući iznose, kamatne stope, rokove otplate i istoriju plaćanja, što pomaže u efektivnom upravljanju kreditnim portfoliom.
- **Organizacija filijala:** Pomaže u upravljanju podacima o različitim bankovnim filijalama, olakšavajući administraciju i operativnu koordinaciju između njih.
- **Efikasnost i tačnost:** Automatsko evidentiranje i povezivanje podataka smanjuje mogućnost grešaka i povećava efikasnost poslovanja.

Zaključak

The Oracle logo is displayed in a bold, red, sans-serif font. It is positioned within a large white circle that is partially visible on the left side of the slide. The word "ORACLE" is followed by a registered trademark symbol (®).

ORACLE®

- Značaj ovog sistema je u tome što omogućava bankama da efikasno upravljaju svim aspektima poslovanja, poboljšavaju korisničku uslugu, povećavaju operativnu efikasnost i osiguravaju tačnost i pouzdanost finansijskih podataka.

ORACLE®