

Basis Data II



Pertemuan Ke-1

(*Overview* Sistem Basisdata, RDBMS, SQL)

Noor Ifada

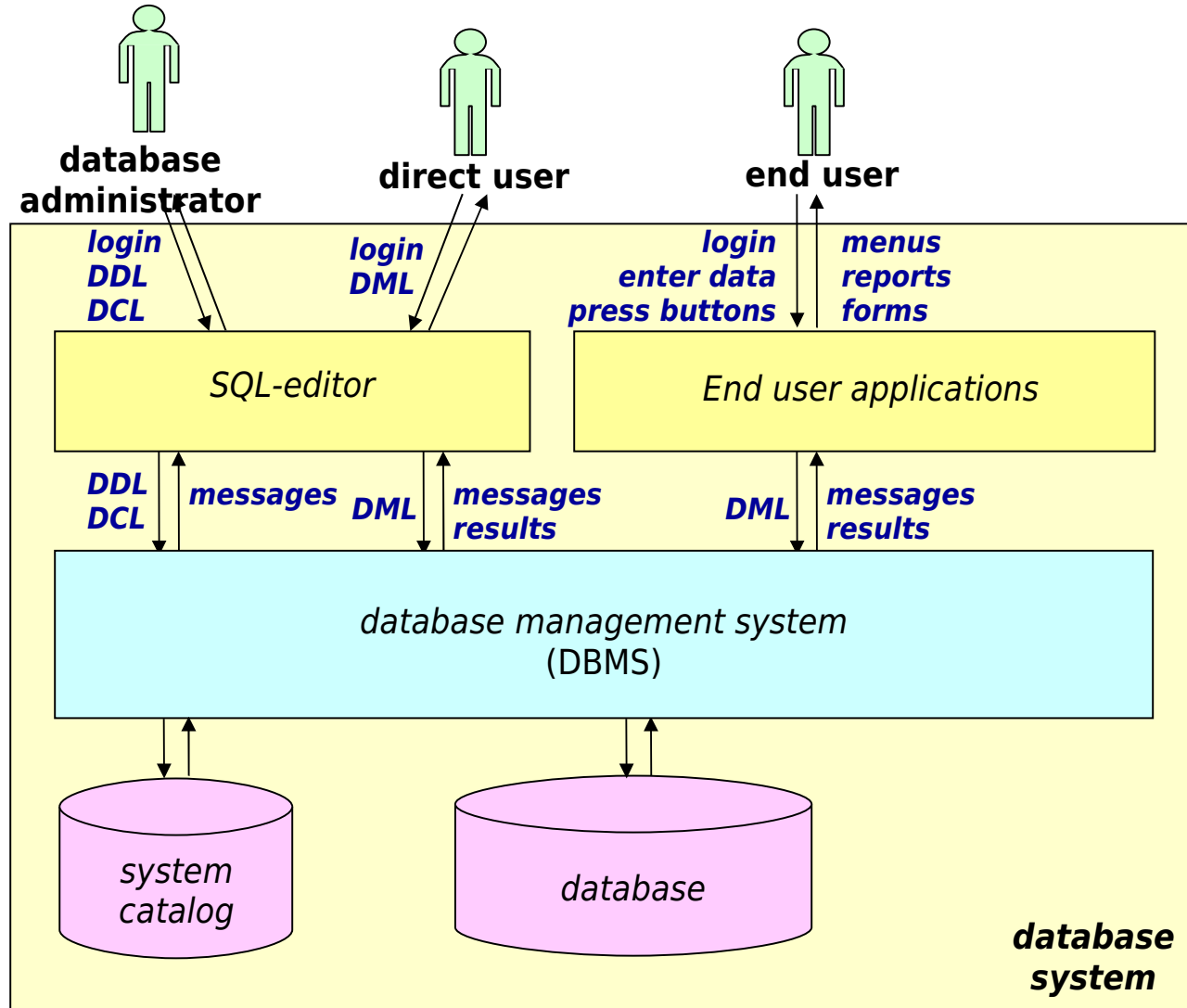
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Sub Pokok Bahasan

- Sistem Basisdata
- Basisdata Relasional
- SQL
- Basisdata Contoh (digunakan dalam perkuliahan)
 - Basisdata *Tennis*
 - Basisdata *President*

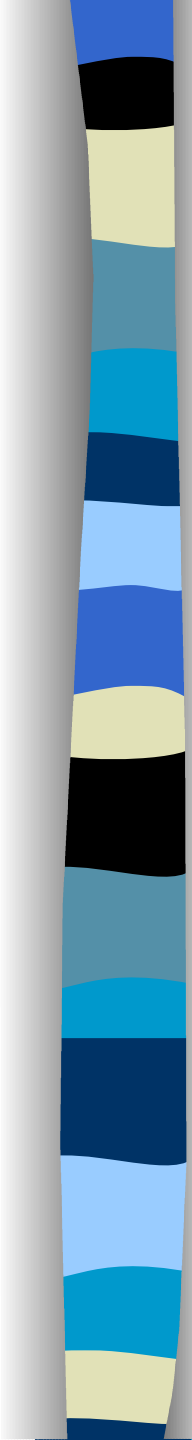
Sistem Basisdata





Basisdata Relasional

- Sebagian besar sistem informasi yang ada saat ini dibangun berdasarkan pada basisdata relasional (basisdata yang merupakan kumpulan tabel) dan SQL (*Structured Query Language*)
- Contoh Relational Database Management Systems (RDBMS): MS SQL Server, Oracle, MySQL, PostgreSQL, dll

- 
- Struktur:
 - tabel, kolom, dan tipe data
 - Integritas:
 - *unicity constraints, primary keys*
 - *NOT NULL constraint*
 - *Foreign keys*
 - *Other constraints*
 - Manipulasi data:
 - *retrieving information*
 - *inserting, updating, and deleting data*



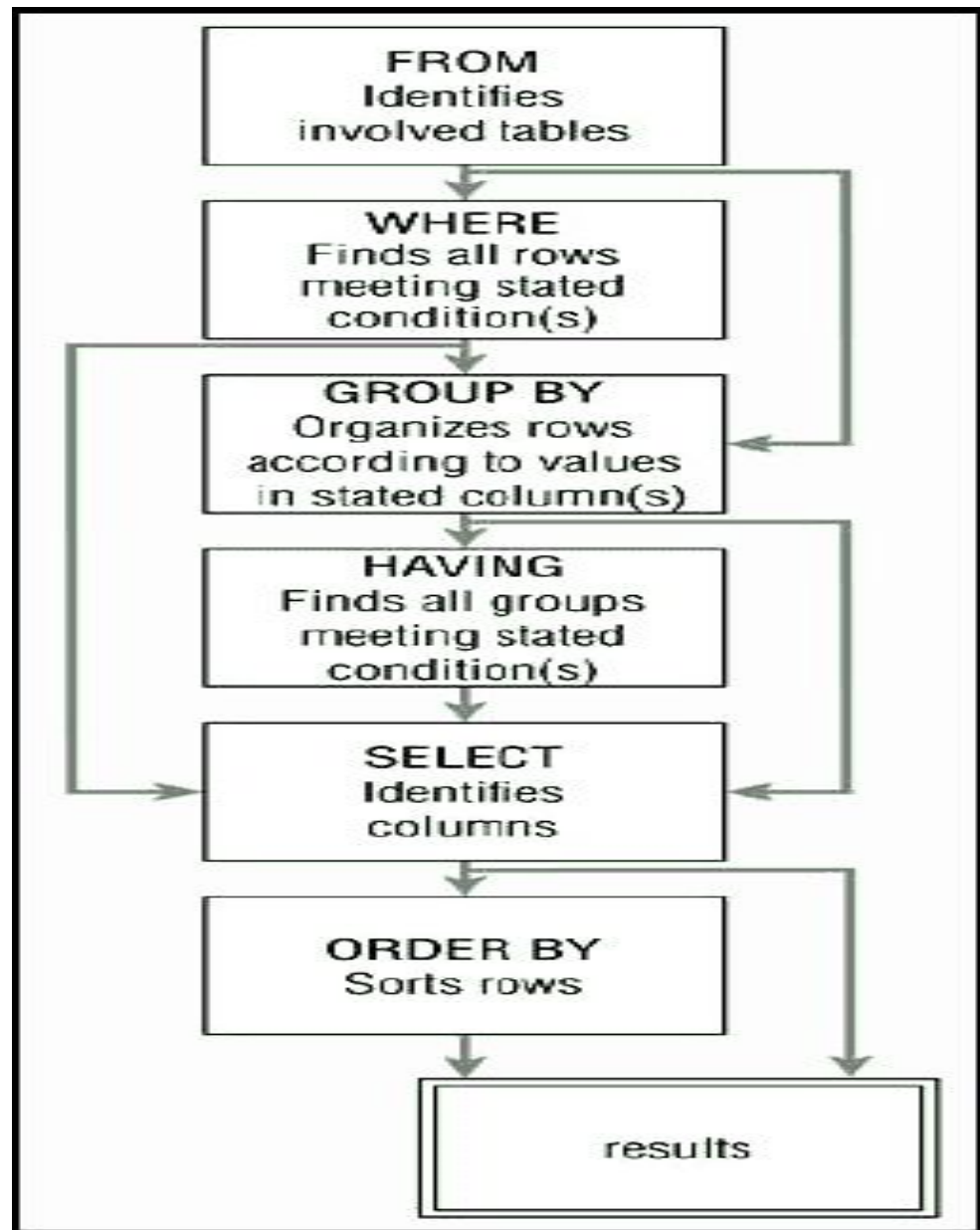
Structured Language Query (SQL)

- adalah bahasa standar yang digunakan untuk memanipulasi basisdata relasional

Terdiri dari:

- *Data Definition Language (DDL):*
 - *CREATE tables, indexes, views, Establish primary / foreign keys, DROP / ALTER tables etc*
- *Data Manipulation Language (DML):*
 - *INSERT / UPDATE / DELETE, SELECT etc.*
- *Data Control Language (DCL):*
 - *COMMIT / ROLLBACK work, GRANT / REVOKE etc*

Statemen *SELECT*:



Contoh penggunaan statemen SELECT

Cari nomor pemain yang telah melakukan setidaknya dua kali penalti yang jumlahnya lebih dari \$25!
Urutkan hasil berdasarkan nomor pemainnya!

Query:

```
SELECT      PLAYERNO
FROM        PENALTIES
WHERE       AMOUNT > 25
GROUP BY   PLAYERNO
HAVING      COUNT (*) > 1
ORDER BY   PLAYERNO;
```

Query:
 SELECT
 FROM
 WHERE
 GROUP BY
 HAVING
 ORDER BY

PLAYERNO
 PENALTIES
 AMOUNT > 25
 PLAYERNO
 COUNT (*) > 1
 PLAYERNO;

FROM

| PAYMENTNO | PLAYERNO | PAYMENT_DATE | AMOUNT |
|-----------|----------|--------------|--------|
| 1 | 6 | 1980-12-08 | 100.00 |
| 2 | 44 | 1981-05-05 | 75.00 |
| 3 | 27 | 1983-09-10 | 100.00 |
| 4 | 104 | 1984-12-08 | 50.00 |
| 5 | 44 | 1980-12-08 | 25.00 |
| 6 | 8 | 1980-12-08 | 25.00 |
| 7 | 44 | 1982-12-30 | 30.00 |

WHERE

| PAYMENTNO | PLAYERNO | PAYMENT_DATE | AMOUNT |
|-----------|----------|--------------|--------|
| 1 | 6 | 1980-12-08 | 100.00 |
| 2 | 44 | 1981-05-05 | 75.00 |
| 3 | 27 | 1983-09-10 | 100.00 |
| 4 | 104 | 1984-12-08 | 50.00 |
| 7 | 44 | 1982-12-30 | 30.00 |
| 8 | 27 | 1984-11-12 | 75.00 |

GROUP BY

| PAYMENTNO | PLAYERNO | PAYMENT_DATE | AMOUNT |
|-----------|----------|--------------|--------|
| 1 | 6 | 1980-12-08 | 100.00 |
| 2 | 44 | 1981-05-05 | 75.00 |
| 7 | 44 | 1982-12-30 | 30.00 |
| 3 | 27 | 1983-09-10 | 100.00 |
| 8 | 27 | 1984-11-12 | 75.00 |
| 4 | 104 | 1984-12-08 | 50.00 |

HAVING

| PAYMENTNO | PLAYERNO | PAYMENT_DATE | AMOUNT |
|-----------|----------|--------------|--------|
| 2 | 44 | 1981-05-05 | 75.00 |
| 7 | 44 | 1982-12-30 | 30.00 |
| 3 | 27 | 1983-09-10 | 100.00 |
| 8 | 27 | 1984-11-12 | 75.00 |

SELECT

| PLAYERNO |
|----------|
| 44 |
| 27 |

ORDER BY

| PLAYERNO |
|----------|
| 27 |
| 44 |



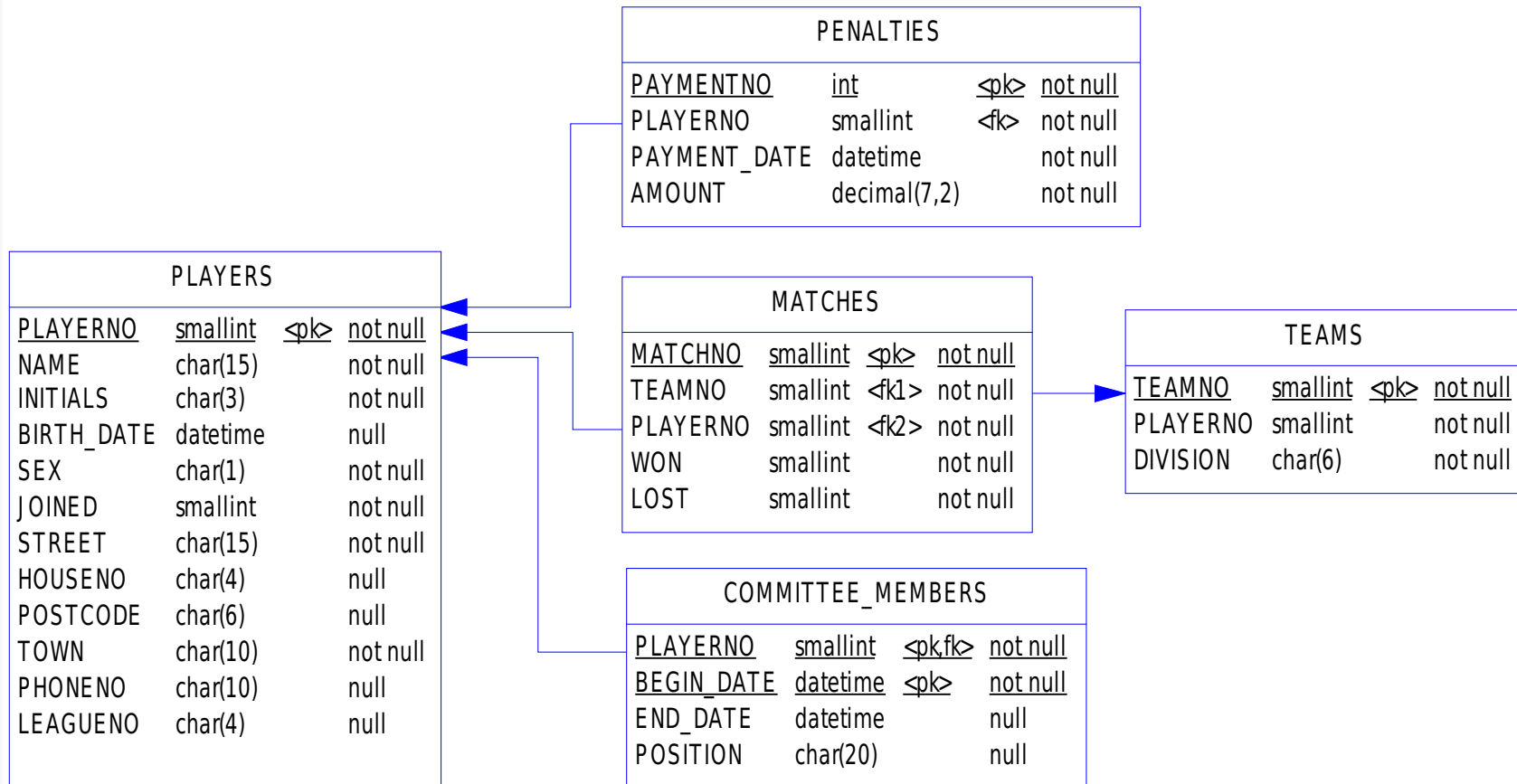
Basisdata Contoh

- Basisdata *Tennis*
- Basisdata *President*

kedua Basisdata tersebut akan digunakan untuk menjelaskan materi perkuliahan (termasuk untuk pemberian contoh dan soal latihan)

Basisdata *Tennis*

■ Skema basisdata



■ Populasi basisdata *Tennis*

Tabel *Players*

| PLAY | NAME | INIT | BIRTH_D | SEX | JOIN | STREET | HOUS | POSTCOI | TOWN | PHONENO | LEAC |
|------|-----------|------|----------|-----|------|----------------|------|---------|-----------|------------|------|
| 2 | Everett | R | 9/1/48 | M | 1975 | Stoney Road | 43 | 3575NH | Stratford | 070-237893 | 2411 |
| 6 | Parmenter | R | 6/25/64 | M | 1977 | Haseltine Lane | 80 | 1234KK | Stratford | 070-476537 | 8467 |
| 7 | Wise | GWS | 5/11/63 | M | 1981 | Edgecombe Way | 39 | 9758VB | Stratford | 070-347689 | |
| 8 | Newcastle | B | 7/8/62 | F | 1980 | Station Road | 4 | 6584WO | Inglewood | 070-458458 | 2983 |
| 27 | Collins | DD | 12/28/64 | F | 1983 | Long Drive | 804 | 8457DK | Eltham | 079-234857 | 2513 |
| 28 | Collins | C | 6/22/63 | F | 1983 | Old Main Road | 10 | 1294QK | Midhurst | 010-659599 | |
| 39 | Bishop | D | 10/29/56 | M | 1980 | Eaton Square | 78 | 9629CD | Stratford | 070-393435 | |
| 44 | Baker | E | 1/9/63 | M | 1980 | Lewis Street | 23 | 4444LJ | Inglewood | 070-368753 | 1124 |
| 57 | Brown | M | 8/17/71 | M | 1985 | Edgecombe Way | 16 | 4377CB | Stratford | 070-473458 | 6409 |
| 83 | Hope | PK | 11/11/56 | M | 1982 | Magdalene Road | 16A | 1812UP | Stratford | 070-353548 | 1608 |
| 95 | Miller | P | 5/14/63 | M | 1972 | High Street | 33A | 5746OP | Douglas | 070-867564 | |
| 100 | Parmenter | P | 2/28/63 | M | 1979 | Haseltine Lane | 80 | 6494SG | Stratford | 070-494593 | 6524 |
| 104 | Moorman | D | 5/10/70 | F | 1984 | Stout Street | 65 | 9437AO | Eltham | 079-987571 | 7060 |
| 112 | Bailey | IP | 10/1/63 | F | 1984 | Vixen Road | 8 | 6392LK | Plymouth | 010-548745 | 1319 |

■ Populasi basisdata *Tennis* (contd-2)

Tabel *Teams*

| TEAMNO | PLAYERNO | DIVISION |
|--------|----------|----------|
| 1 | 6 | first |
| 2 | 27 | second |

Tabel *Penalties*

| PAYMENTNO | PLAYERNO | PEN_DATE | AMOUNT |
|-----------|----------|----------|--------|
| 1 | 6 | 12/8/80 | 100 |
| 2 | 44 | 5/5/81 | 75 |
| 3 | 27 | 9/10/83 | 100 |
| 4 | 104 | 12/8/84 | 50 |
| 5 | 44 | 12/8/80 | 25 |
| 6 | 8 | 12/8/80 | 25 |
| 7 | 44 | 12/30/82 | 30 |
| 8 | 27 | 11/12/84 | 75 |

Tabel *Matches*

| MATCHNO | TEAMNO | PLAYERNO | WON | LOST |
|---------|--------|----------|-----|------|
| 1 | 1 | 6 | 3 | 1 |
| 2 | 1 | 6 | 2 | 3 |
| 3 | 1 | 6 | 3 | 0 |
| 4 | 1 | 44 | 3 | 2 |
| 5 | 1 | 83 | 0 | 3 |
| 6 | 1 | 2 | 1 | 3 |
| 7 | 1 | 57 | 3 | 0 |
| 8 | 1 | 8 | 0 | 3 |
| 9 | 2 | 27 | 3 | 2 |
| 10 | 2 | 104 | 3 | 2 |
| 11 | 2 | 112 | 2 | 3 |
| 12 | 2 | 112 | 1 | 3 |
| 13 | 2 | 8 | 0 | 3 |

■ Populasi basisdata *Tennis* (contd-3)

Tabel *Committee_members*

| PLAYERNO | BEGIN_DATE | END_DATE | POSITION |
|----------|------------|----------|----------------|
| 2 | 1/1/90 | 12/31/92 | Chairman |
| 2 | 1/1/94 | | General member |
| 6 | 1/1/90 | 12/31/90 | Secretary |
| 6 | 1/1/91 | 12/31/92 | General member |
| 6 | 1/1/92 | 12/31/93 | Treasurer |
| 6 | 1/1/93 | | Chairman |
| 8 | 1/1/90 | 12/31/90 | Treasurer |
| 8 | 1/1/91 | 12/31/91 | Secretary |
| 8 | 1/1/93 | 12/31/93 | General member |
| 8 | 1/1/94 | | General member |
| 27 | 1/1/90 | 12/31/90 | General member |
| 27 | 1/1/91 | 12/31/91 | Treasurer |
| 27 | 1/1/93 | 12/31/93 | Treasurer |
| 57 | 1/1/92 | 12/31/92 | Secretary |
| 95 | 1/1/94 | | Treasurer |
| 112 | 1/1/92 | 12/31/92 | General member |
| 112 | 1/1/94 | | Secretary |

Terminologi Basisdata Relasional

Nama Tabel

MATCHES:

| MATCHNO | TEAMNO | PLAYERNO | WON | LOST |
|---------|--------|----------|-----|------|
| 1 | 1 | 6 | 3 | 1 |
| 2 | 1 | 6 | 2 | 3 |
| 3 | 1 | 6 | 3 | 0 |
| 4 | 1 | 44 | 3 | 2 |
| 5 | 1 | 83 | 0 | 3 |
| 6 | 1 | 2 | 1 | 3 |
| 7 | 1 | 57 | 3 | 0 |
| 8 | 1 | 8 | 0 | 3 |
| 9 | 2 | 27 | 3 | 2 |
| 10 | 2 | 104 | 3 | 2 |
| 11 | 2 | 112 | 2 | 3 |
| 12 | 2 | 112 | 1 | 3 |
| 13 | 2 | 8 | 0 | 3 |

Kolom/column

Nama Kolom/Atribut/Attribute

Tabel/Relasi/Relation

Baris/row/tuple/
record



Terminologi (contd-2)

- *Candidate key, primary key, alternative key, foreign key, foreign key reference = relationship*
- *column value constraint, row level constraint, other constraint*
- *Domain, domain value constraint, tipe data untuk domain/kolom*
- *Integritas Entity*
- *Integritas Referential*

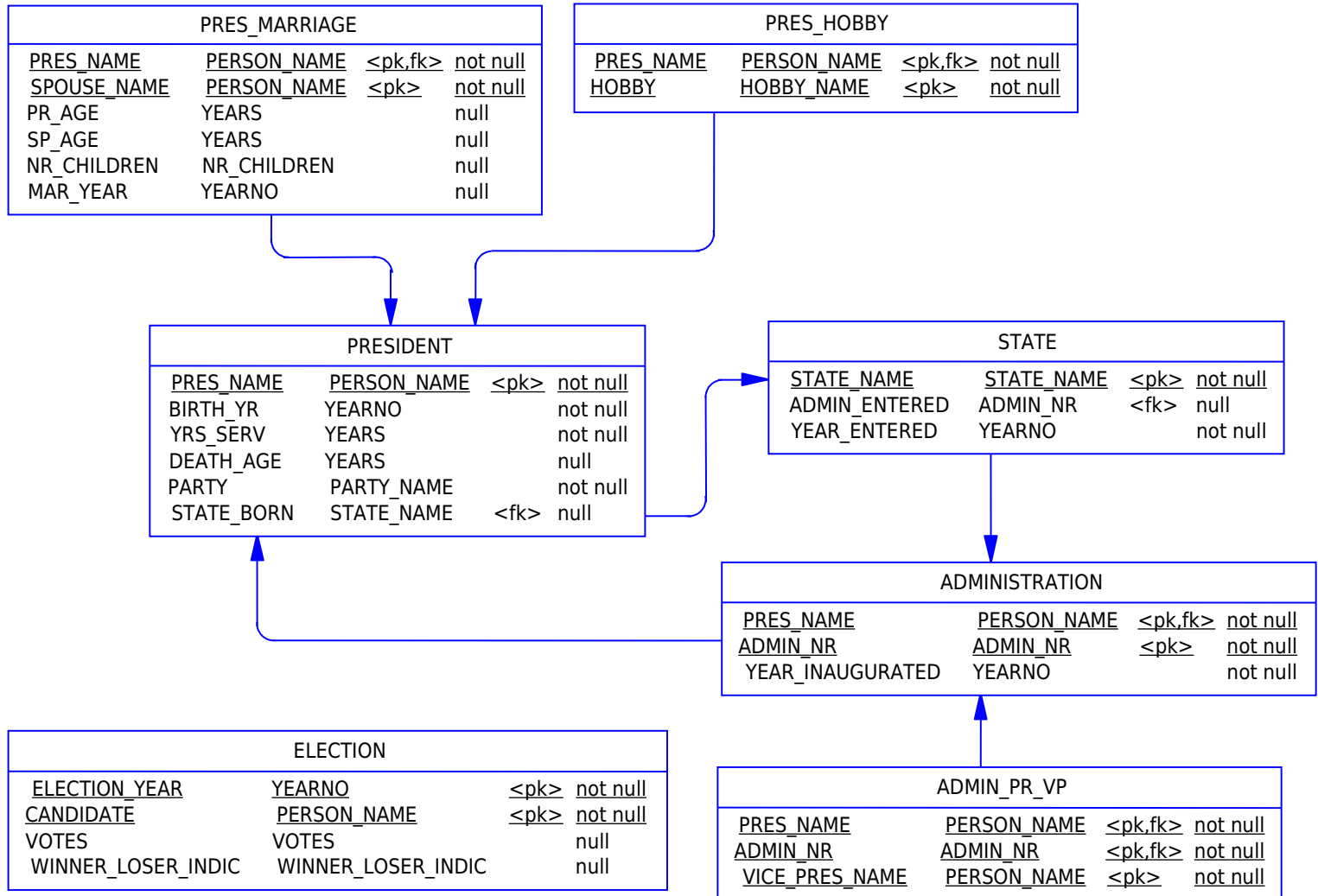
Constraints pada basisdata tennis

- Column value constraints:
 - SEX IN {'M','F'}
 - WON, LOST IN {0,1,2,3}
 - POSITION IN
{'Chairman', 'Secretary', 'Treasurer', 'General member'}

- Row level constraints:
 - Table PLAYERS:
YEAR (BIRTH_DATE) <= JOINED
 - Table COMMITTEE_MEMBERS:
END_DATE >= BEGIN_DATE

Basisdata *President*

■ Skema basisdata



■ Populasi basisdata *President*

Tabel *President*

| PRES_NAME | BIRTH_YR | YRS_SERV | DEATH_AGE | PARTY | STATE_BORN |
|--------------|----------|----------|-----------|------------|---------------|
| Adams J | 1735 | 4 | 90 | Federalist | Massachusetts |
| Adams J Q | 1767 | 4 | 80 | Demo-Rep | Massachusetts |
| Arthur C A | 1830 | 3 | 56 | Republican | Vermont |
| Buchanan J | 1791 | 4 | 77 | Democrati | Pennsylvania |
| Carter J E | 1924 | 4 | | Democrati | Georgia |
| Cleveland G | 1837 | 8 | 71 | Democrati | New Jersey |
| Coolidge C | 1872 | 5 | 60 | Republican | Vermont |
| Eisenhower D | 1890 | 8 | 79 | Republican | Texas |
| Fillmore M | 1800 | 2 | 74 | Whig | New York |
| ... | | ... | | | |

Tabel *Pres_Hobby*

| PRES_NAME | HOBBY |
|-------------|--------------|
| Adams J Q | Billiards |
| Adams J Q | Swimming |
| Adams J Q | Walking |
| Arthur C A | Fishing |
| Carter J E | Peanuts |
| Cleveland G | Fishing |
| Coolidge C | Fishing |
| Coolidge C | Golf |
| Coolidge C | Indian Clubs |
| | |

Tabel *State*

| STATE_NAME | ADMIN_ENTERE D | YEAR_ENTERED |
|-------------|-------------------|--------------|
| Alabama | 8 | 1819 |
| Alaska | 43 | 1959 |
| Arizona | 31 | 1912 |
| Arkansas | 12 | 1836 |
| California | 16 | 1850 |
| Colorado | 22 | 1876 |
| Connecticut | | 1776 |
| Delaware | | 1776 |
| | ... | |

Populasi basisdata *President* (contd-2)

Tabel *Pres_marriage*

| PRES_NAME | SPOUSE_NAME | PR_AGE | SP_AGE | NR_CHILDREN | MAR_YEAR |
|----------------|--------------|--------|--------|-------------|----------|
| Adams J | Smith A | 30 | 19 | 5 | 1765 |
| Adams J Q | Johnson L C | 30 | 22 | 4 | 1797 |
| Arthur C A | Herndon E L | 29 | 22 | 3 | 1859 |
| Carter J E | Smith R | 21 | 18 | 4 | 1946 |
| Cleveland G | Folson F | 49 | 21 | 5 | 1886 |
| Coolidge C | Goodhue G A | 33 | 26 | 2 | 1905 |
| Eisenhower D D | Doud G | 25 | 19 | 2 | 1916 |
| Fillmore M | McIntosh C C | 58 | 44 | 0 | 1858 |
| Fillmore M | Powers A | 26 | 27 | 2 | 1826 |
| | | ... | ... | ... | |

Tabel *Administration*

| ADMIN_NR | PRES_NAME | YEAR INAUGURATED |
|----------|--------------|------------------|
| 1 | Washington G | 1789 |
| 2 | Washington G | 1793 |
| 3 | Adams J | 1797 |
| 4 | Jefferson T | 1801 |
| 5 | Jefferson T | 1805 |
| 6 | Madison J | 1809 |
| 7 | Madison J | 1813 |
| 8 | Monroe J | 1817 |
| 9 | Monroe J | 1821 |
| ... | | |

Tabel *Admin_pres_vp*

| ADMIN_NR | PRES_NAME | VICE PRES NAME |
|----------|--------------|----------------|
| 1 | Washington G | Adams J |
| 2 | Washington G | Adams J |
| 3 | Adams J | Jefferson T |
| 4 | Jefferson T | Burr A |
| 5 | Jefferson T | Clinton G |
| 6 | Madison J | Clinton G |
| 7 | Madison J | Gerry E |
| 8 | Monroe J | Tompkins D |
| 9 | Monroe J | Tompkins D |
| ... | | |

■ Populasi basisdata *President* (contd-3)

Tabel *Election*

| ELECTION_YEAR | CANDIDATE | NR_VOTES | WINNER_LOSER_INDIC |
|---------------|--------------|----------|--------------------|
| 1789 | Adams J | 34 | L |
| 1789 | Armstrong J | 1 | L |
| 1789 | Clinton G | 3 | L |
| 1789 | Hancock J | 4 | L |
| 1789 | Harrison R H | 6 | L |
| 1789 | Huntington S | 2 | L |
| 1789 | Jay J | 9 | L |
| 1789 | Lincoln B | 1 | L |
| 1789 | Milton J | 2 | L |
| 1789 | Rutledge J | 6 | L |
| 1789 | Telfair E | 1 | L |
| 1789 | Washington G | 69 | W |
| 1792 | Adams J | 77 | L |
| 1792 | Burr A | 1 | L |
| 1792 | Clinton G | 50 | L |
| 1792 | Jefferson T | 4 | L |
| 1792 | Washington G | 132 | W |
| | | ... | ... |

Constraints pada basisdata *President*

• Domains:

| Domain name | Data type | Domain value constraint |
|--------------------|------------------|--------------------------------|
| PERSON_NAME | CHAR(16) | |
| YEARNO | NUMERIC(4,0) | values \geq 1700 |
| YEARS | NUMERIC(3,0) | values \geq 0 |
| PARTY_NAME | CHAR(11) | |
| STATE_NAME | CHAR(15) | |
| NR_CHILDREN | NUMERIC(2,0) | values \geq 0 |
| HOBBY_NAME | CHAR(20) | |
| ADMIN_NR | NUMERIC(4,0) | values \geq 1 |
| VOTES | NUMERIC(4,0) | values \geq 1 |
| WINNER_LOSER_INDIC | CHAR(1) | values in {'W', 'L'} |

• Column value constraints:

| | |
|-----------------------------------|--------------------|
| PRES_MARRIAGE (PR_AGE) | values \geq 18 |
| PRES_MARRIAGE (SP_AGE) | values \geq 16 |
| STATE (YEAR_ENTERED) | values \geq 1776 |
| ADMINISTRATION (YEAR_INAUGURATED) | values \geq 1789 |
| ELECTION (ELECTION_YEAR) | values \geq 1789 |

Constraints pada basisdata *President* (contd-2)

Inner-table special integrity rules:

- *If in column ADMINISTRATION (ADMIN_NR) values are stored, all values from 1 to the maximum stored value must be present.*
- *In table STATE column ADMIN_ENTERED must have a null-value if and only if in the same row column YEAR_ENTERED has the value 1776.*
- *All rows in table ELECTION having an equal value in column ELECTION_YEAR must in column WINNER_LOSER_INDIC either all have null-values or for exactly one of those rows the value 'W' and for all other rows the value 'L'.*
- *Furthermore in the last case in the same rows also all column VOTES must have not null-values.*

Intra-table special integrity rules:

- *If (p,y1) in PRESIDENT (PRES_NAME, BIRTH_YR) and (p,y2) in PRES_MARRIAGE (PRES_NAME, MAR_YEAR), then $y2 \geq y1 + 18$.*
- *If (p,y1) in PRESIDENT (PRES_NAME, BIRTH_YR) and (p,a,y2) in PRES_MARRIAGE (PRES_NAME, PR_AGE, MAR_YEAR), then $a = y2 - y1$ or $a = y2 - y1 - 1$.*