

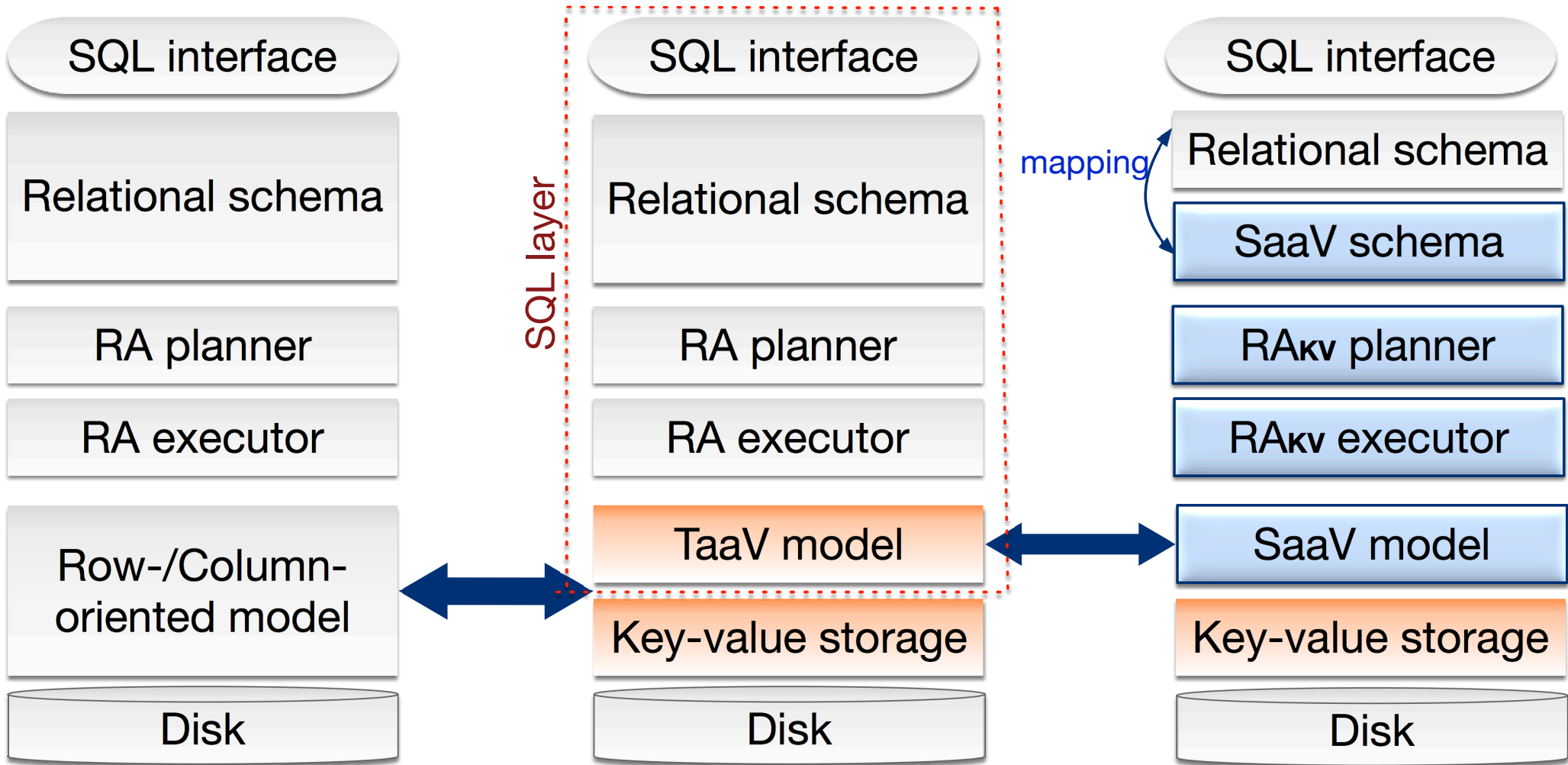




- ▶ A new data model for “SQL-on-KV”
  - from TaaV to SaaV (Set-as-a-Value)



**The SQL@KV-store Paradigm**



(a) RDBMS

(b) SQL layers@KV

(c) Zidian



a new *Normal Form* for relational DB

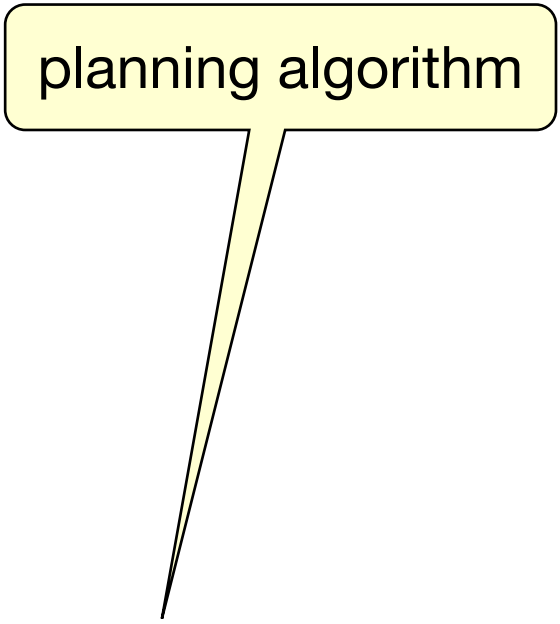






an *algebra* for *SaaV*

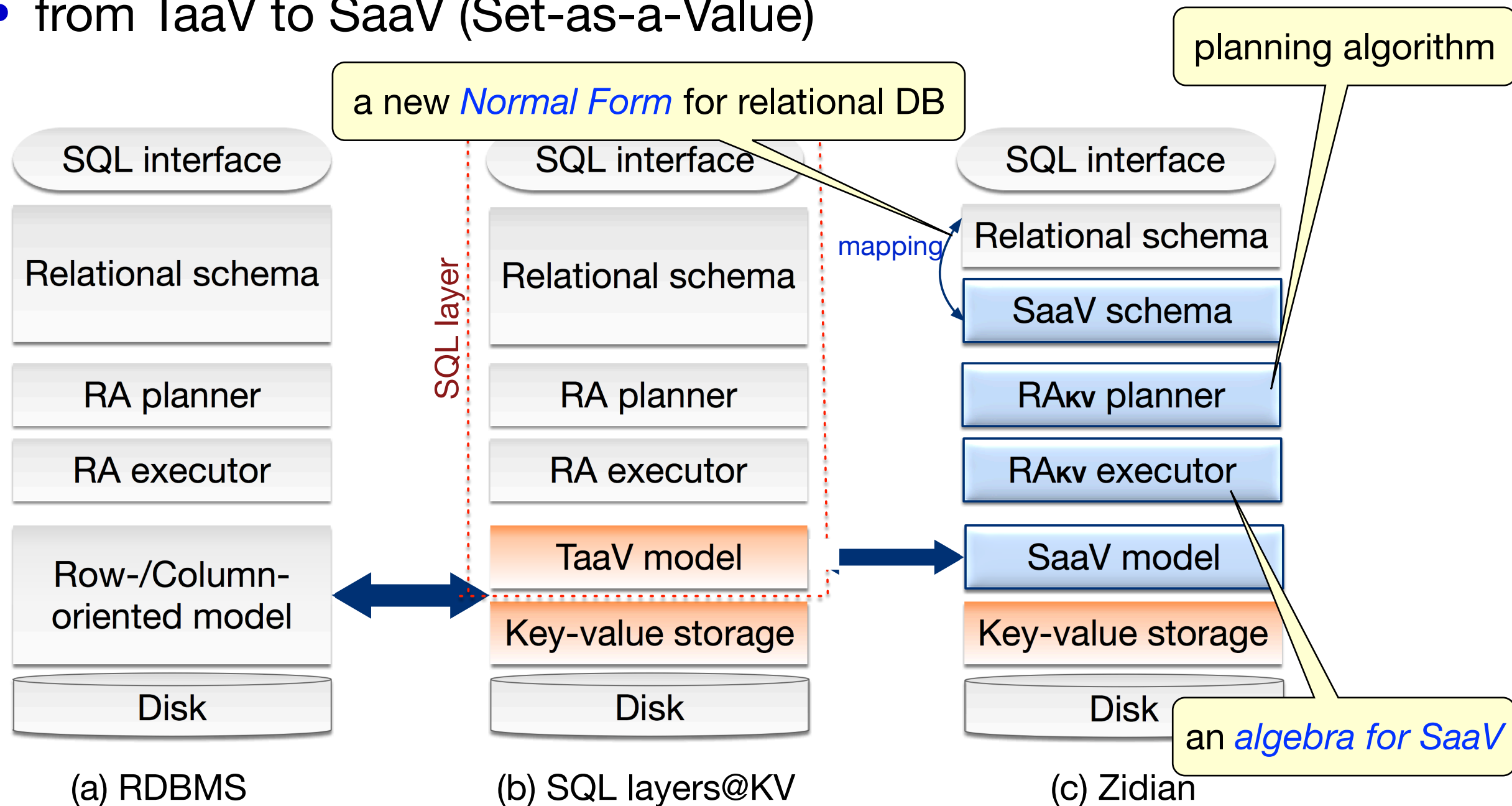
planning algorithm



*SaaV allows theoretically more efficient algebra operators*

# The SQL@KV-store Paradigm

- ▶ A new data model for “SQL-on-KV”
  - from TaaV to SaaV (Set-as-a-Value)



*SaaV allows theoretically more efficient algebra operators*

# Effectiveness

| Query  | Q1                | Q2  | Q3                | Q4                | Q5                | Q6                | Q7                | Q8                | Q9                | Q10               | Q11               | Q12               | Q13               | Q14               | Q15               | Q16               | Q17               | Q18               | Q19               | Q20               | Q21               | Q22 |
|--------|-------------------|-----|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-----|
| Zidian | $3.5 \times 10^1$ | 2.8 | $2.1 \times 10^1$ | 4.9               | $1.4 \times 10^1$ | 0.13              | $1.3 \times 10^2$ | $5.8 \times 10^1$ | $8.6 \times 10^1$ | $1.4 \times 10^1$ | 0.12              | 2.6               | $3.9 \times 10^1$ | 4.0               | 0.24              | 6.3               | 0.046             | $1.1 \times 10^1$ | 0.061             | $1.3 \times 10^1$ | $2.6 \times 10^1$ | 1.8 |
| Cockr. | $4.2 \times 10^2$ | N/A | $1.6 \times 10^2$ | N/A               | $8.8 \times 10^2$ | $1.3 \times 10^2$ | $7.3 \times 10^2$ | MAX               | MAX               | $8.3 \times 10^2$ | $4.1 \times 10^1$ | $1.6 \times 10^2$ | $1.3 \times 10^3$ | $2.0 \times 10^2$ | $3.0 \times 10^2$ | $2.3 \times 10^1$ | ERR               | $6.1 \times 10^2$ | N/A               | N/A               | N/A               | N/A |
| MyRo.  | $1.9 \times 10^2$ | 3.6 | $1.2 \times 10^2$ | $3.1 \times 10^1$ | $7.2 \times 10^1$ | $6.7 \times 10^1$ | $2.5 \times 10^2$ | $1.9 \times 10^2$ | $1.3 \times 10^3$ | $4.6 \times 10^1$ | $2.2 \times 10^2$ | $1.3 \times 10^2$ | N/A               | $7.3 \times 10^1$ | $1.2 \times 10^2$ | 9.3               | $7.1 \times 10^2$ | $7.4 \times 10^1$ | $8.5 \times 10^1$ | $1.2 \times 10^2$ | $7.0 \times 10^2$ | MAX |

Evaluation time (s: seconds) of TPC-H queries (N/A: *syntax not supported*; ERR: *run-time error*; MAX: *> 1 hour*)

- Zidian outperforms Myrocks ([Facebook](#)) and CockroachDB ([Baidu](#)) on *each and every* of the TPC-H bechmark query on 10GB data;
- On average is 33.5X and 20.5X faster than Cockr. and Myrocks, up to  $1.3 \times 10^3$  and  $1.5 \times 10^4$ , respectively.