Database Systems

In This Video

- Why do we use database systems?
- ACID

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- And this is before we even talk about the real hard part!

ACID

- **A**tomicity
- **C**onsistency
- **I**solation
- **D**urability

Atomicity

```
a = BankAccount("Alice", balance=100)
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# transfer money from Alice to Bob
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Alice	Bob
100	0

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wrap in a transaction

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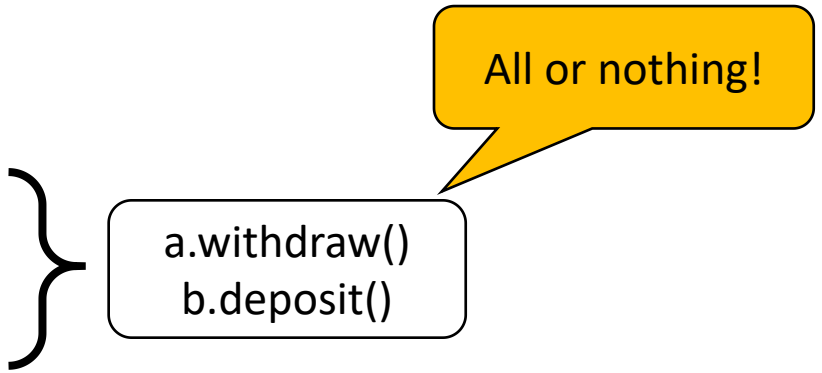

Consistency

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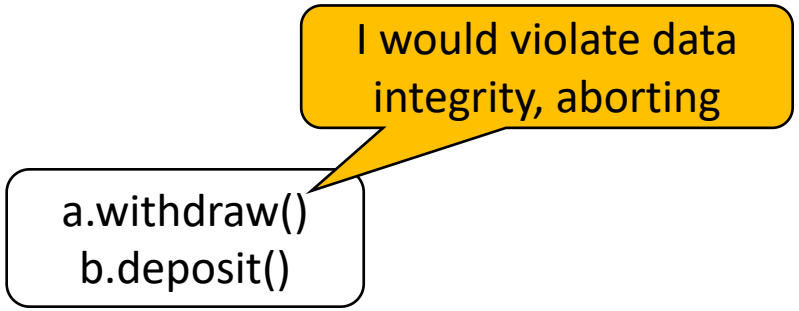

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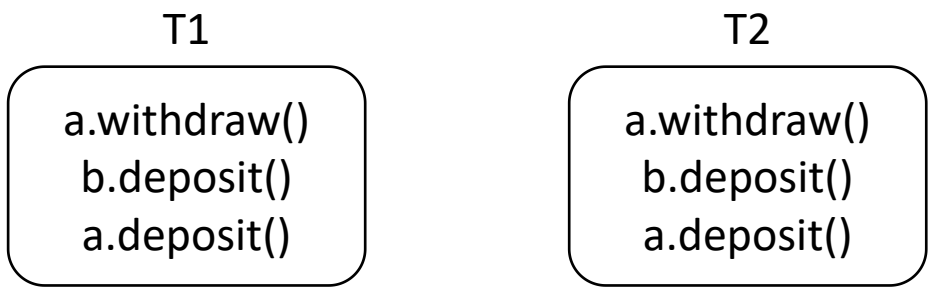

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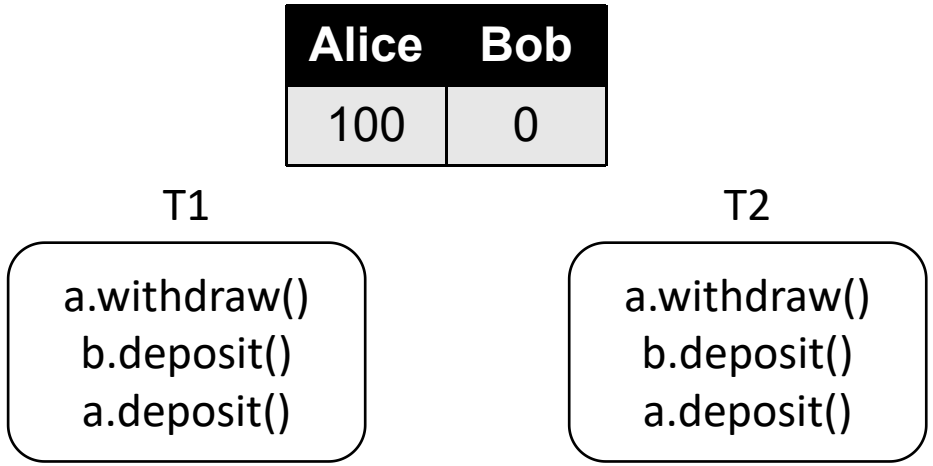

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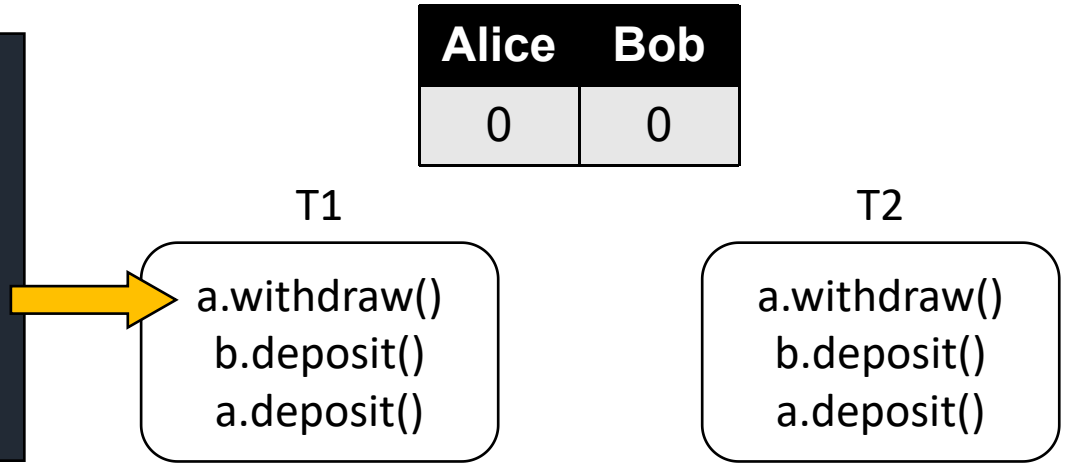

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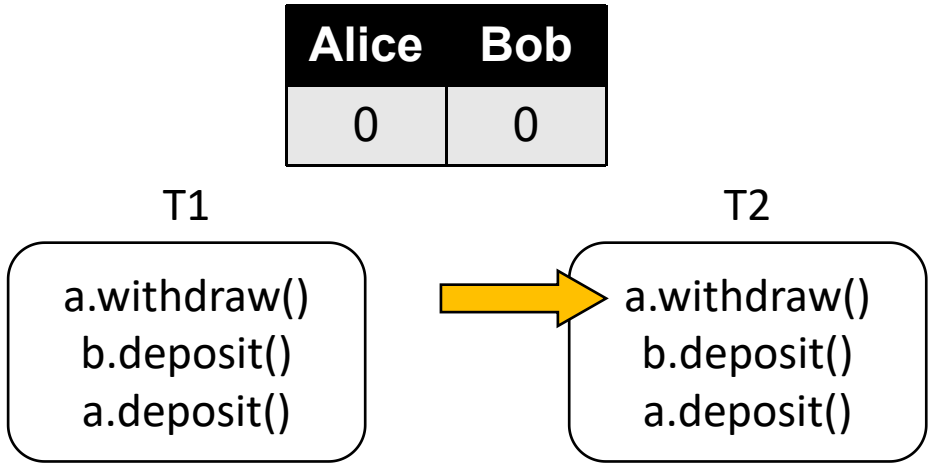

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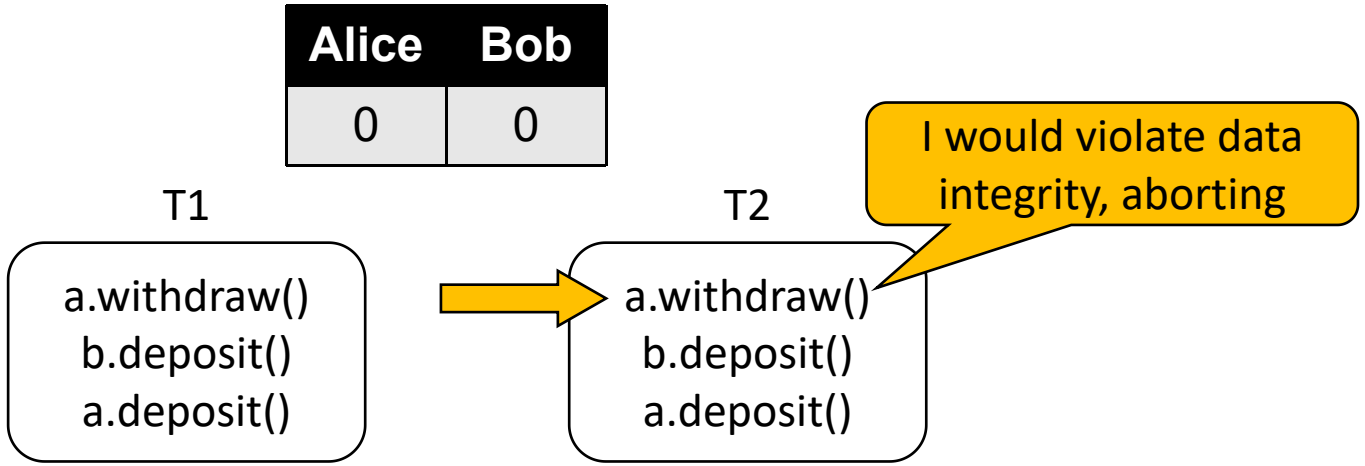

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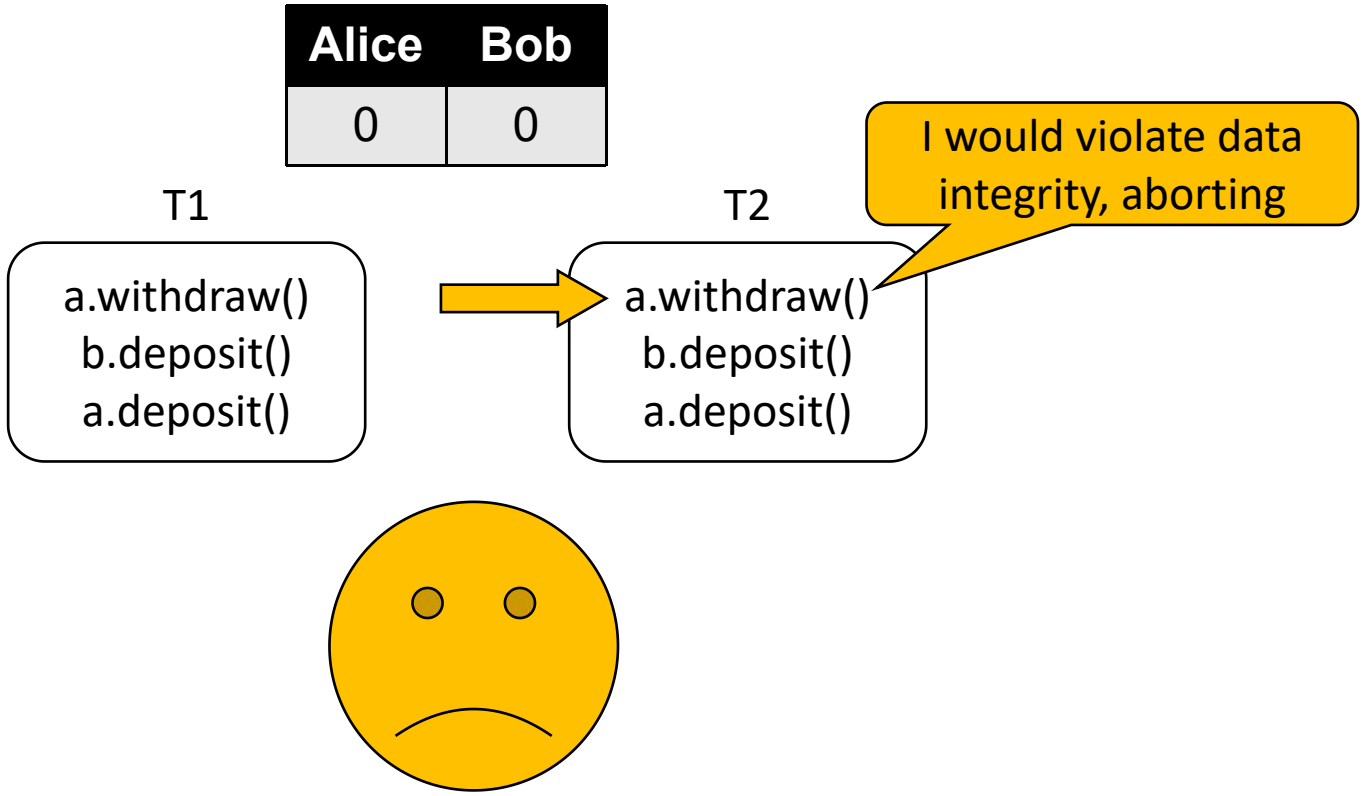

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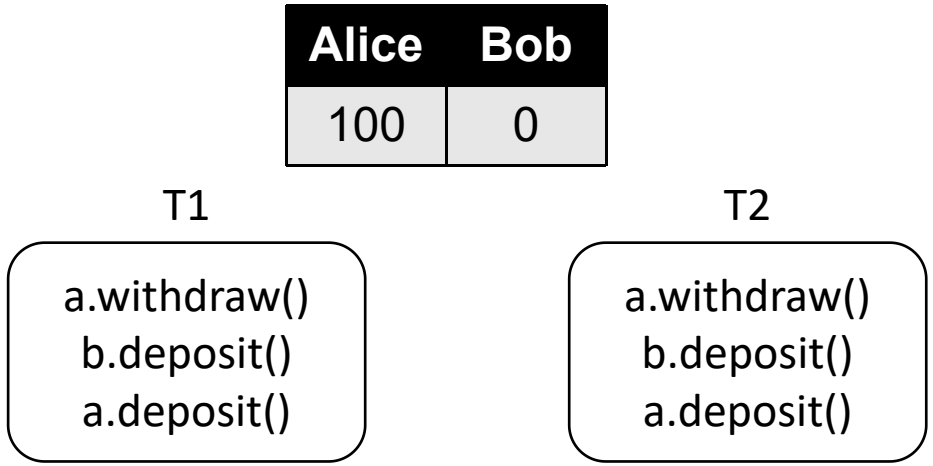

Isolation can guarantee T1 and T2 are NOT concurrent

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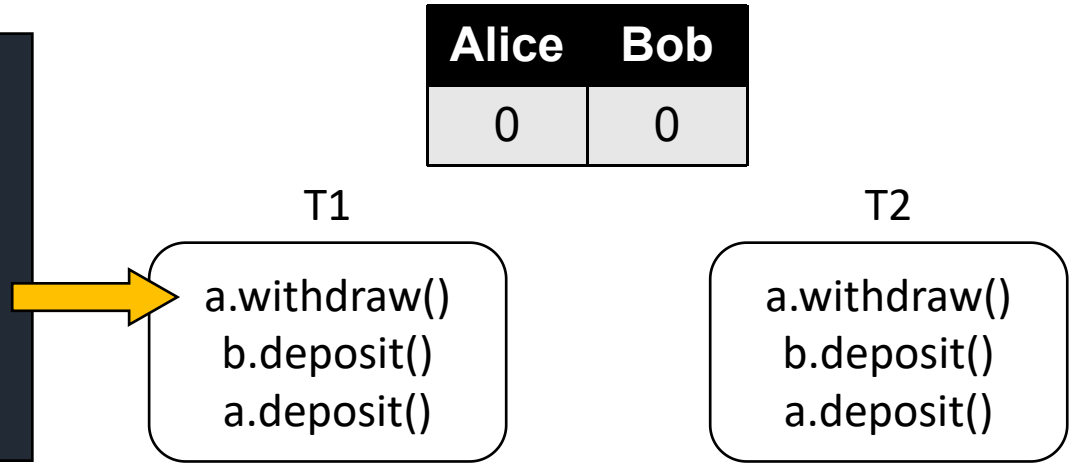

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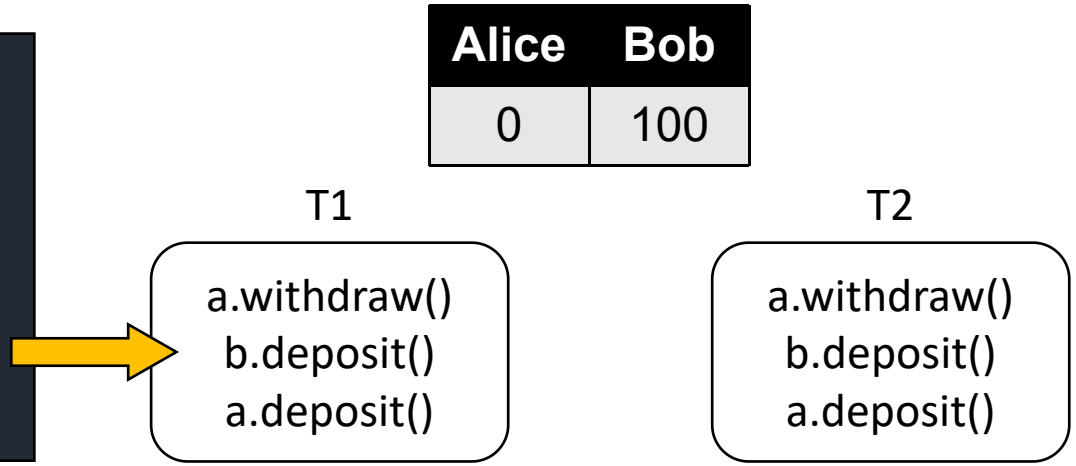

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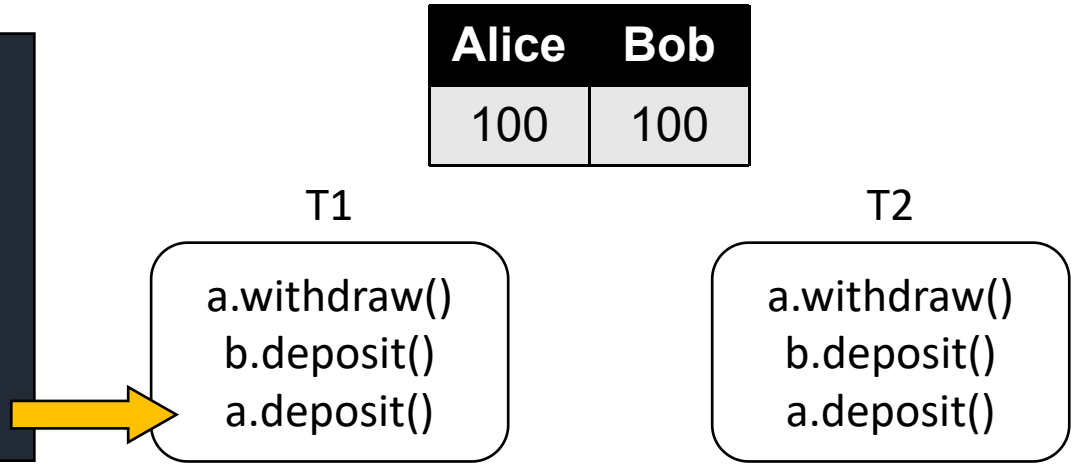

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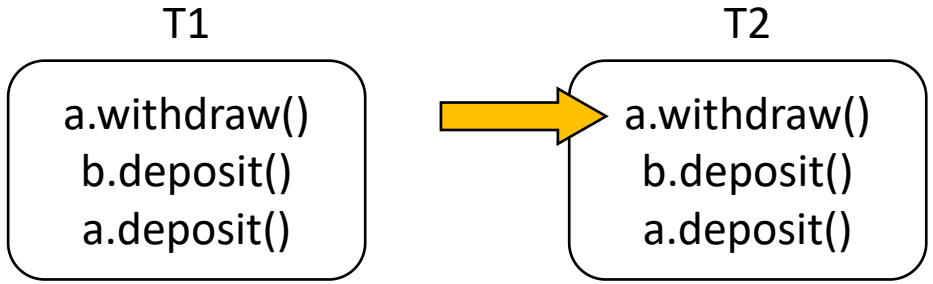
Alice	Bob
0	100



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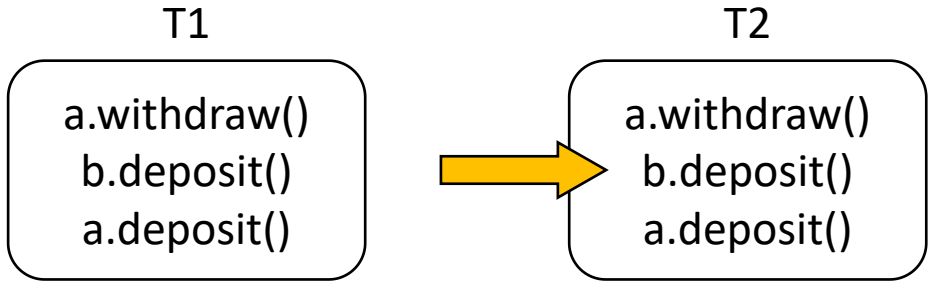
Alice	Bob
0	200



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Alice	Bob
100	200

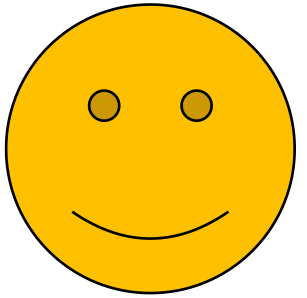
T1

```
a.withdraw()
b.deposit()
a.deposit()
```

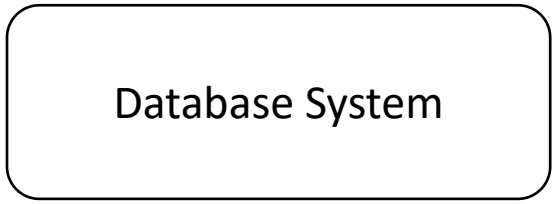
T2

```
a.withdraw()
b.deposit()
a.deposit()
```

Isolation can guarantee T1 and T2 are NOT concurrent



Durability



Durability

Database System

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Durability

Database System

Alice	Bob
100	0

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Durability

Database System

Alice	Bob
100	0

T1

a.withdraw()
b.deposit()
a.deposit()

Durability

Database System

Alice	Bob
100	100

T1

a.withdraw()
b.deposit()
a.deposit()

Durability

Database System

Alice	Bob
100	100

T2

a.withdraw()
b.deposit()
a.deposit()

Durability

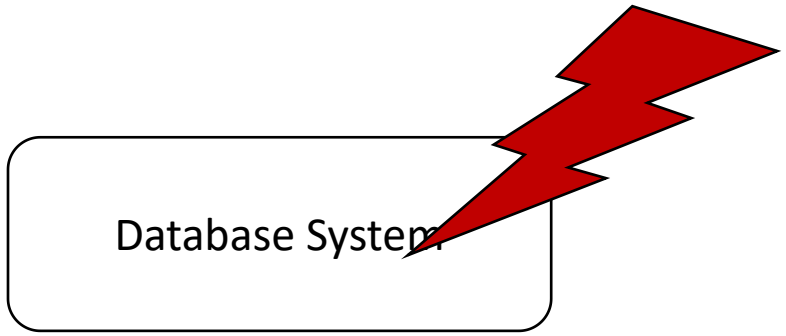
Database System

Alice	Bob
100	200

T2

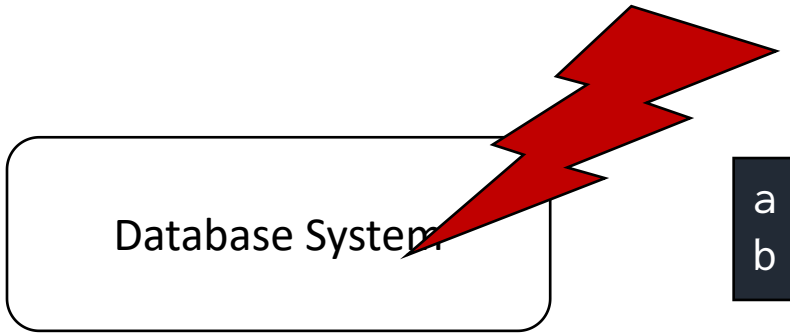
a.withdraw()
b.deposit()
a.deposit()

Durability



Alice	Bob
100	200

Durability

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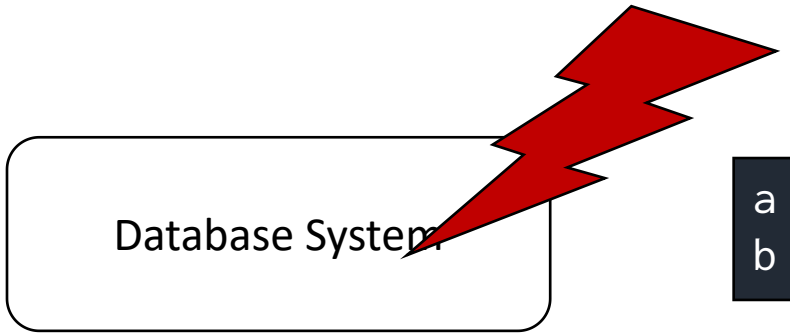
Alice	Bob
100	0

Durability

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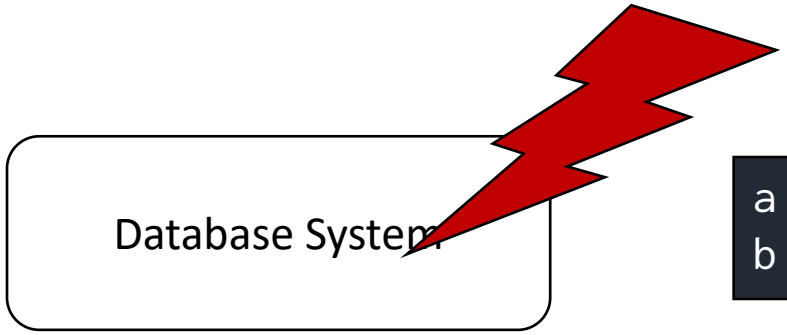
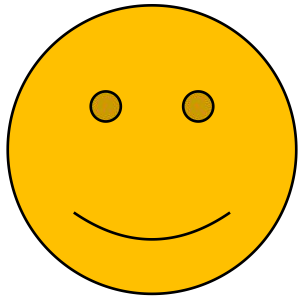
Alice	Bob
100	0

Durability




```
a = restore("Alice")
b = restore("Bob")
```

Alice	Bob
100	200



Why Use A Database System?

- Using an existing database system saves monumental effort
- Reasonably efficient
- Reasonably safe (ACID)
- Reasonably easy to use (SQL)