Politecnico di Torino

DBMG

A design recipe

A notable example of NoSQL design for «distributed transactions»

DANIELE APILETTI

POLITECNICO DI TORINO

Design recipe: banking account

- Banks are serious businesses
- They need serious databases to store serious transactions and serious account information
- They can't lose or create money
- A bank **must** be in balance **all the time**

Design recipe: banking example

- Say you want to give $100 to your cousin Paul for Christmas.
- You need to:

decrease your account balance by 100$

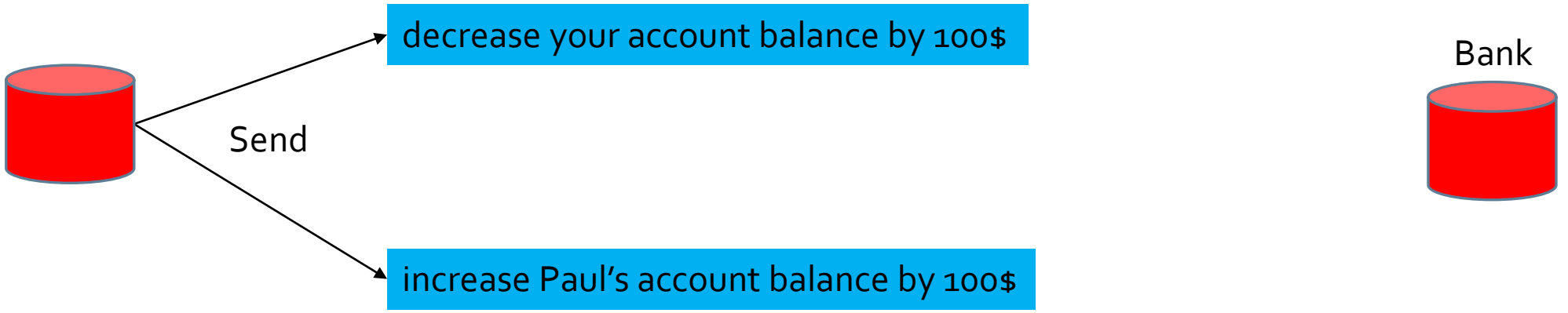
```
{
_id: "account_123456",
account:"bank_account_001",
balance: 900,
timestamp: 1290678353,45,
categories: ["bankTransfer"...],
...
}
```

increase Paul's account balance by 100$

```
{
_id: "account_654321",
account:"bank_account_002",
balance: 1100,
timestamp: 1290678353,46,
categories: ["bankTransfer"...],
...
}
```

Design recipe: banking example

- What if some kind of failure occurs between the two separate updates to the two accounts?



Design recipe: banking example

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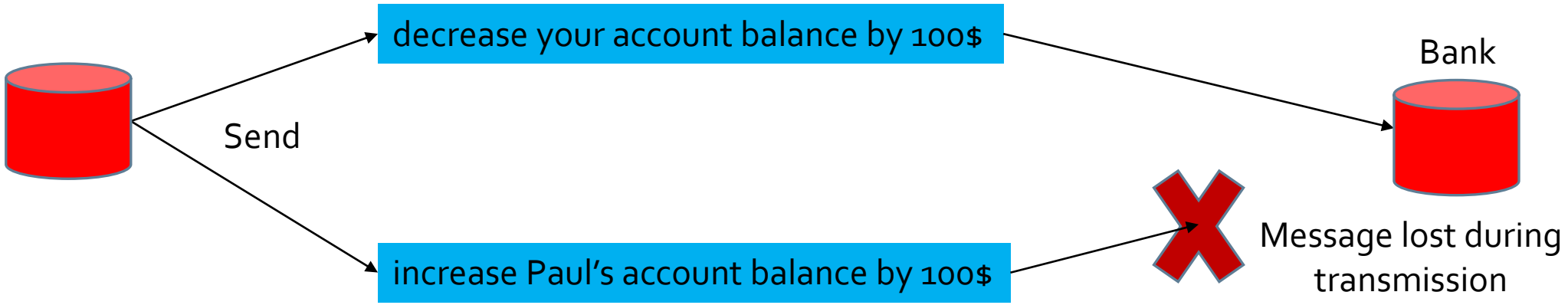

Design recipe: banking example

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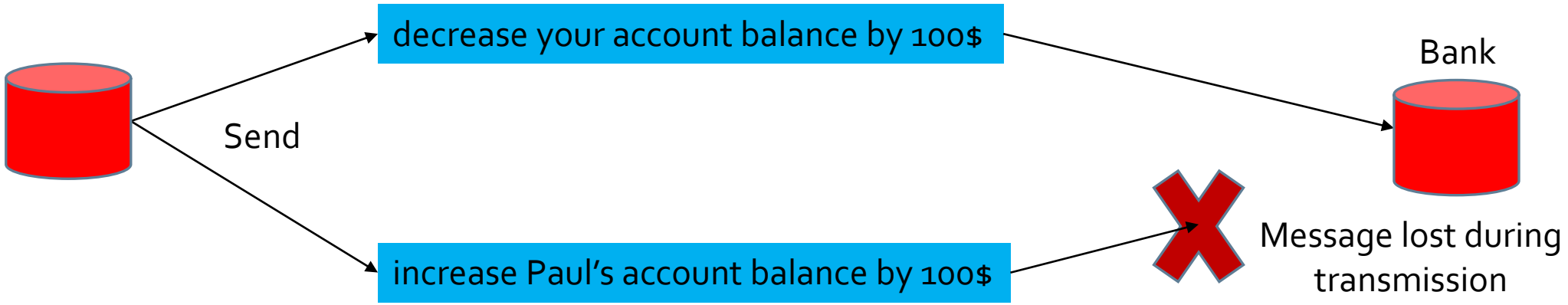
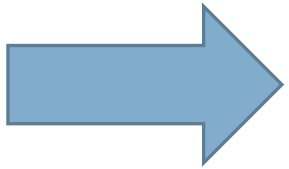


- The NoSQL DB **cannot guarantee the bank balance**
- A different strategy (design) must be adopted

Banking recipe solution

- What if some kind of failure occurs between the two separate updates to the two accounts?
- A NoSQL database without 2-Phase Commit cannot guarantee the bank balance → a different strategy (design) must be adopted.



```
id:     transaction001
from:   "bank_account_001",
to:     "bank_account_002",
qty:    100,
when:   1290678353.45,
...
```

Design recipe: banking example

- How do we read the current account balance?
- Map

```
function(transaction){
 emit(transaction.from, transaction.amount*-1);
 emit(transaction.to, transaction.amount);
}
```

- Reduce

```
function(key, values){
 return sum(values);
}
```

- Result

{rows: [{key: "**bank_account_001**", value: **900**}]

{rows: [{key: "**bank_account_002**", value: **1100**}]

The reduce function receives:

- **key**= **bank_account_001**, **values**=[1000, -100]
- …
- **key**= **bank_account_002**, **values**=[1000, 100]
- …