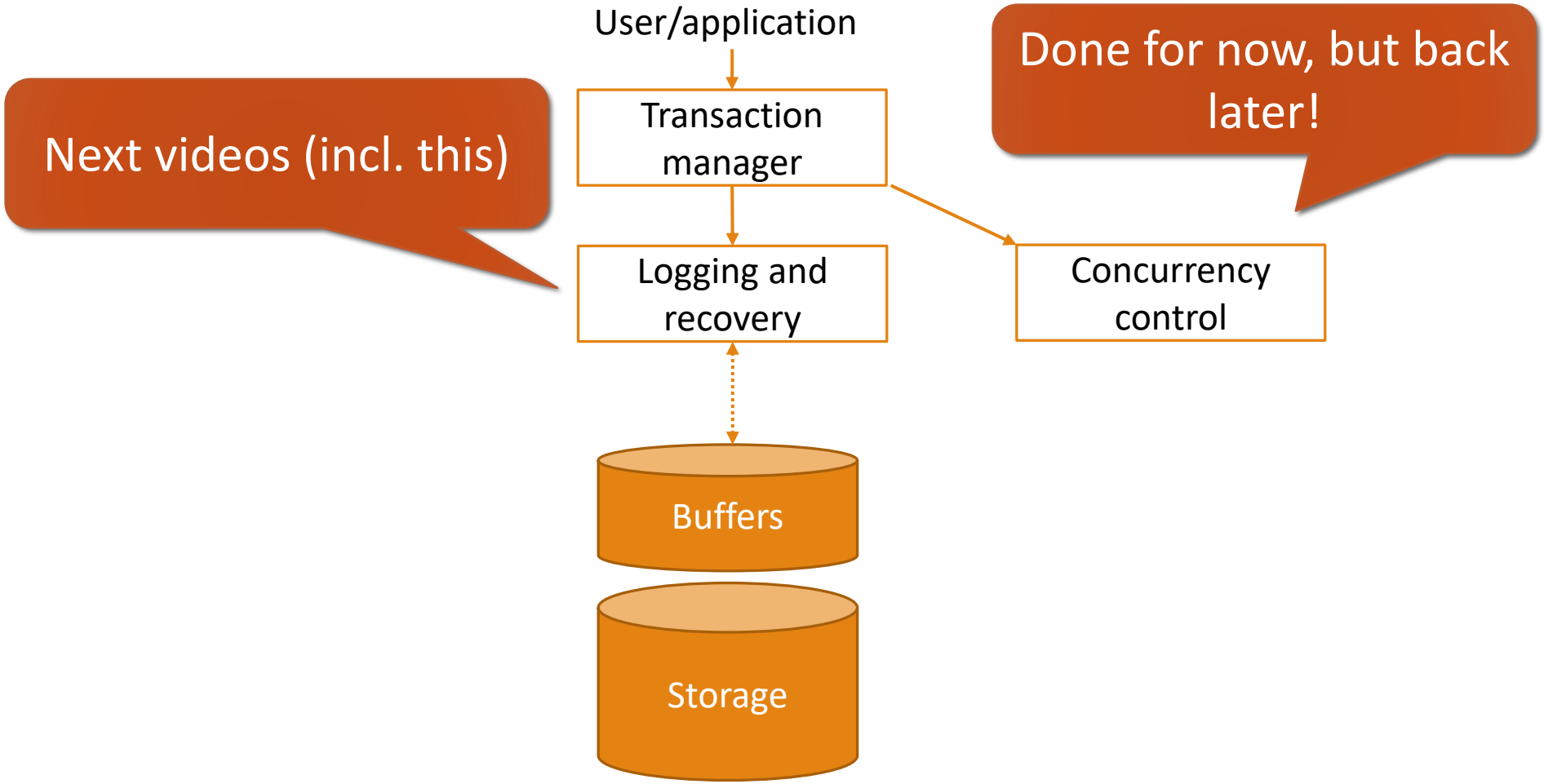
Why Might a Transaction Abort?

Overview of this video

How and why might a transaction abort?

Some relational DBMS Components

(part of a slide in the content video)



Why Might a Transaction Abort?

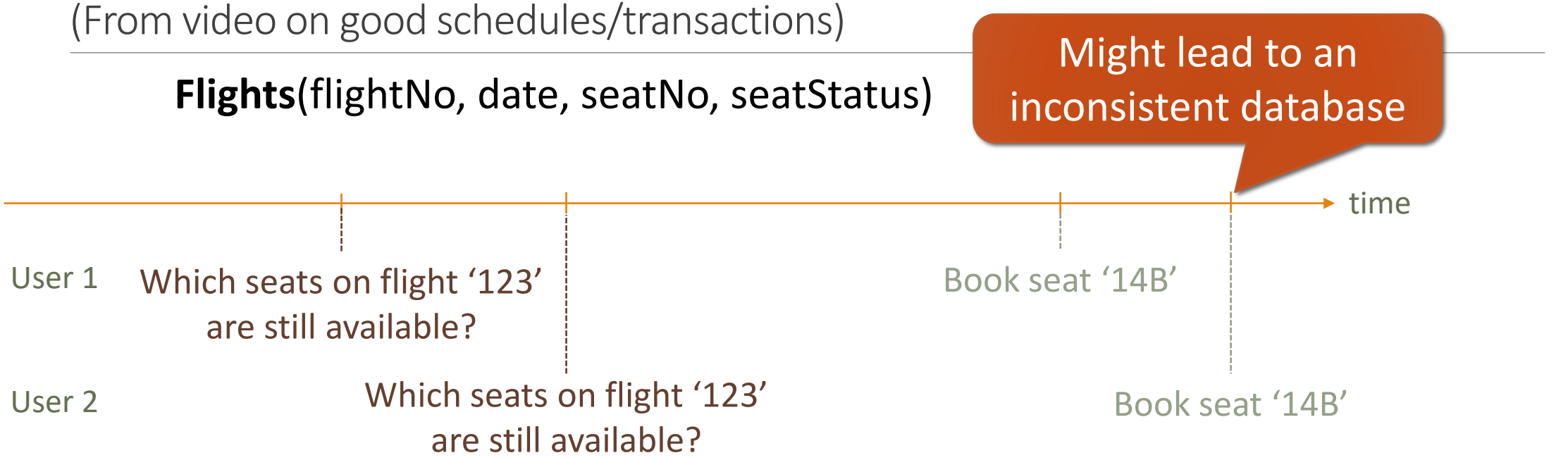
Errors while executing transactions

- Violation of integrity constraints, other run-time errors

Problem 1: Concurrency

(From video on good schedules/transactions)

Flights(flightNo, date, seatNo, seatStatus)




```
SELECT seatNo
FROM   Flights
WHERE  flightNo = 123
   AND date = '2020-10-30'
   AND seatStatus = 'available';
```

```
UPDATE Flights
SET    seatStatus = 'occupied'
WHERE  flightNo = 123
   AND date = '2020-10-30'
   AND seatNo = '14B';
```

Why Might a Transaction Abort?

Errors while executing transactions

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Deadlocks

- E.g., when using two-phase locking
- Concurrency control requests to abort transactions

Deadlocks

T_1
lock(X)
read_item(X)
X := X + 100
write_item(X)
lock(Y)
unlock(X)
read_item(Y)
Y := Y + 100
write_item(Y)
unlock(Y)

T_2
lock(Y)
read_item(Y)
Y := 2*Y
write_item(Y)
lock(X)
unlock(Y)
read_item(X)
X := 2*X
write_item(X)
unlock(X)

$l_1(X); r_1(X); w_1(X); l_2(Y); r_2(Y); w_2(Y);$?

T_2's request for lock on X denied

T_1's request for lock on Y denied

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Deadlocks

- E.g., when using two-phase locking
- Concurrency control requests to abort transactions

Later…

Explicit request

```
START TRANSACTION;

INSERT INTO SeatReservations(CustomerID, SeatNo, FlightNo, Date)
VALUES (12345678, '14B', 123, '2020-10-30');

// additional code

ROLLBACK;
```

Requests to undo all the changes

Beyond the DBMS's Control

Media failures:

- The medium holding the database becomes partially or completely unreadable
- Example: changes of bits, head crashes

Catastrophic events:

- The medium holding the database is destroyed
- Examples: explosions, fires, etc.

System failures

- Information about the active transaction's state is lost
- Examples: power failures, software errors

Beyond the DBMS's Control

Media failures:

- The medium holding the database becomes
- Example: changes of bits, head crashes

Safeguards:

- Archives: full + incremental
- Controlled redundancy
  - RAID
  - Copies at different locations

Catastrophic events:

- The medium holding the database is destroy
- Examples: explosions, fires, etc.

Safeguards:

- Archives at safe and different locations
- Copies at different locations

System failures

- Information about the active transaction's state is lost
- Examples: power failures, software errors

Summary

UNDER THE DBMS CONTROL

Errors while executing transactions

- Violation of integrity constraints, other run-time errors

Deadlocks

- E.g., when using two-phase locking
- Concurrency control requests to abort transactions

Explicit request

- I.e. ROLLBACK;

BEYOND THE DBMS'S CONTROL

Media failures

- The medium holding the database becomes partially or completely unreadable
- Example: changes of bits, head crashes

Catastrophic events

- The medium holding the database is destroyed
- Examples: explosions, fires, etc.

System failures

- **Information about the active transaction's state is lost**
- **Examples: power failures, software errors**