ECS 165A

Milestone 3

Team Waifus Forever

Our Team

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01

Overview

Design and Solution

Implementation

01 Transaction Semantics Overview

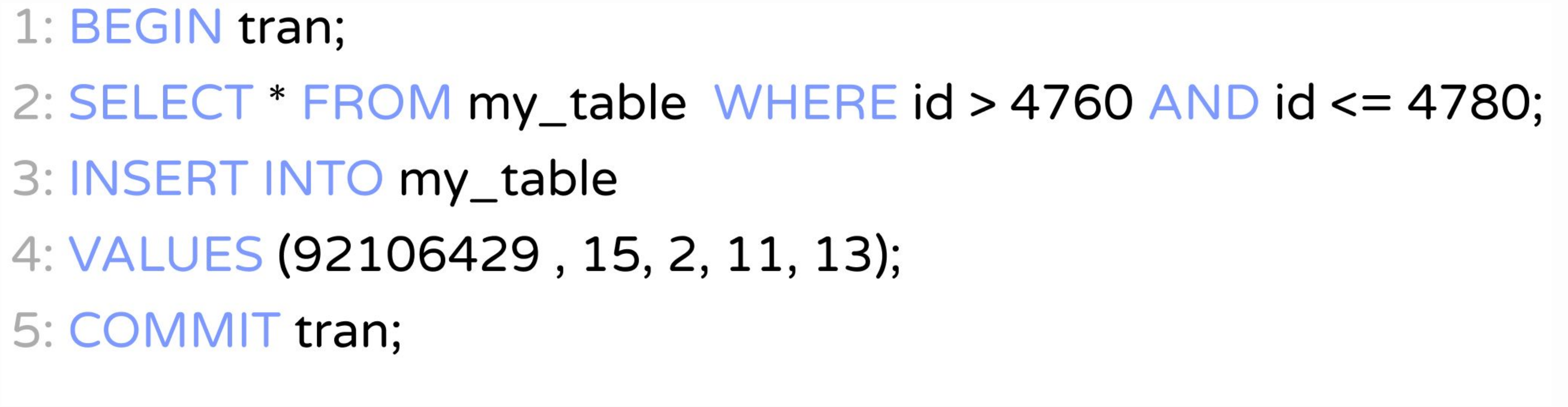
02 QueCC

03 MultiThreading

Bug Fixing

- lazy merge implemented
- restarting database now works
  - we previously could not perform certain queries
- multi-indexing

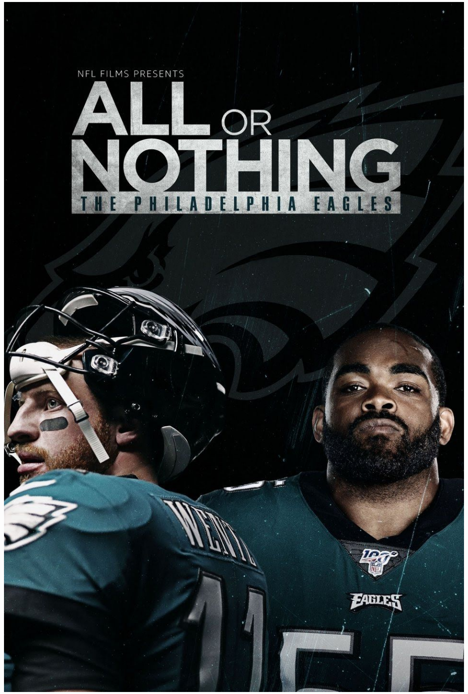
Transaction Semantics

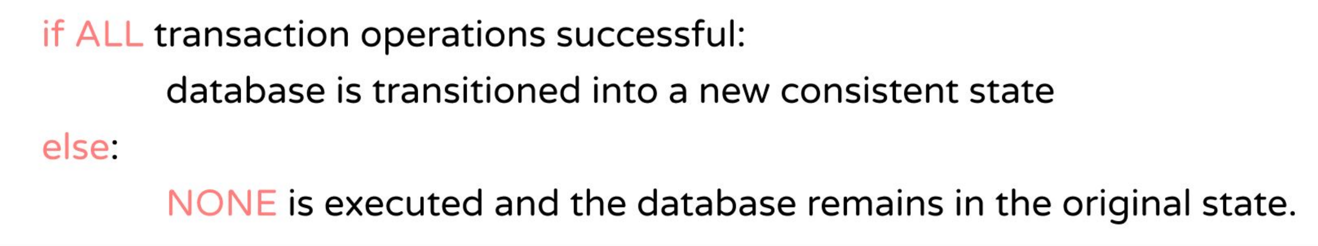


```
BEGIN tran;
SELECT * FROM my_table  WHERE id > 4760 AND id <= 4780;
INSERT INTO my_table
VALUES (92106429 , 15, 2, 11, 13);
COMMIT tran;
```

- set of operations over shared data that transforms the data from one consistent state to another.

Atomicity

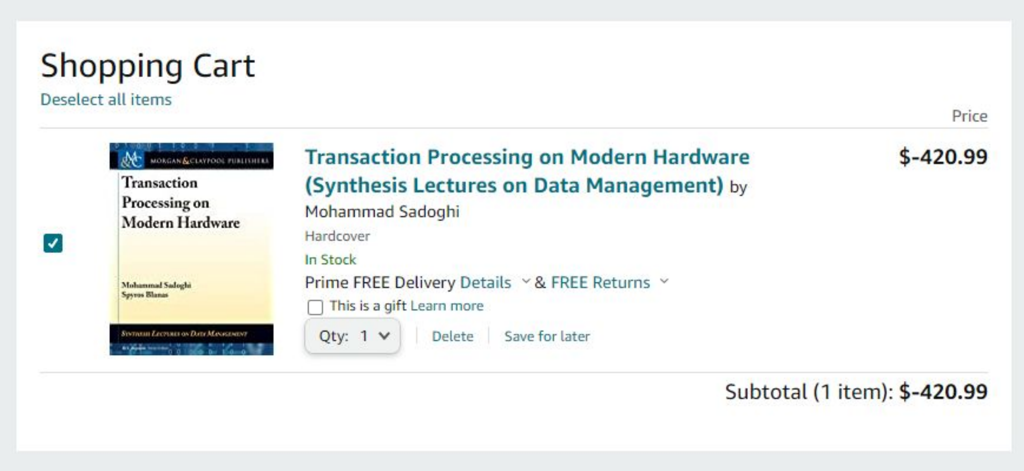




```
if ALL transaction operations successful:
        database is transitioned into a new consistent state
else:
        NONE is executed and the database remains in the original state.
```

Consistency

- integrity constraints set by users



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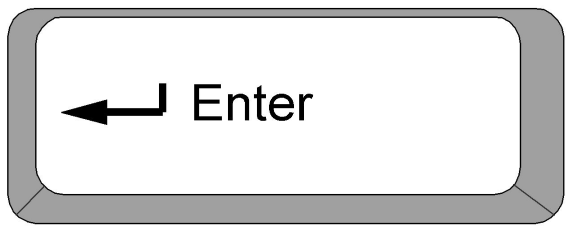
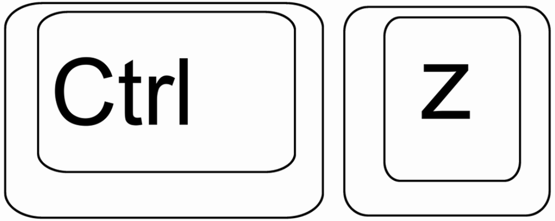
Isolation

- we need to avoid conflicting operations when we interleave concurrent transactions
- CC protocols facilitate coordination among transactions to ensure correct ordering of operations

Durability





- Achieved maintaining an ordered undo and/or redo actions
- Necessary for rolling back aborted transactions when dealing with weak isolation

Queue Oriented Control Free Concurrency[1]

Goal: Abandon complex concurrency:

- Hardware trends point to opportunities in leveraging parallelism
  - more contention

- simply execute transactions serially on disjoint partitions of data
  - H-Store introduced this idea[2]

- Exploit determinism through planning[3]

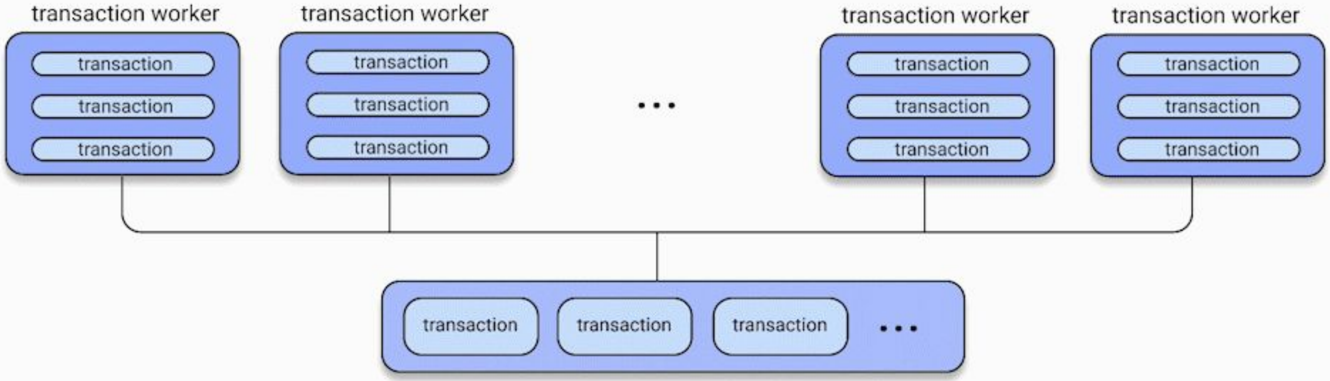
- Deterministic schemes eliminate all execution induced aborts
  - e.g. deadlocks

QueCC: A Queue-oriented, Control-free Concurrency Architecture [1]
Thamir M. Qadah, Mohammad Sadogh, 2018

H-store: A high performance, distributed main memory transaction processing system.[2]
R. Kallman, H. Kimura, J. Natkins, A. Pavlo, A. Rasin, S. Zdonik, E. P. C. Jones, S. Madden, M. Stonebraker, Y. Zhang, J. Hugg, and D. J. Abadi, 2008

Calvin: Fast distributed transactions for partitioned database systems[3]
A. Thomson, T. Diamond, S. C. Weng, K. Ren, P. Shao, and D. J. Abadi, 2012

QueCC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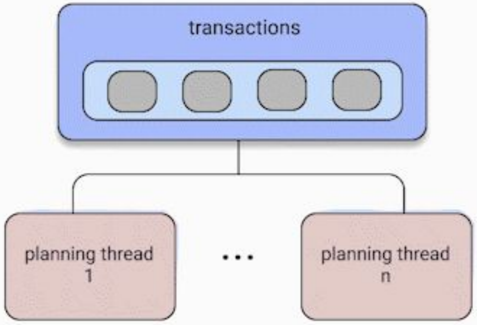
QueCC

Planning Stage



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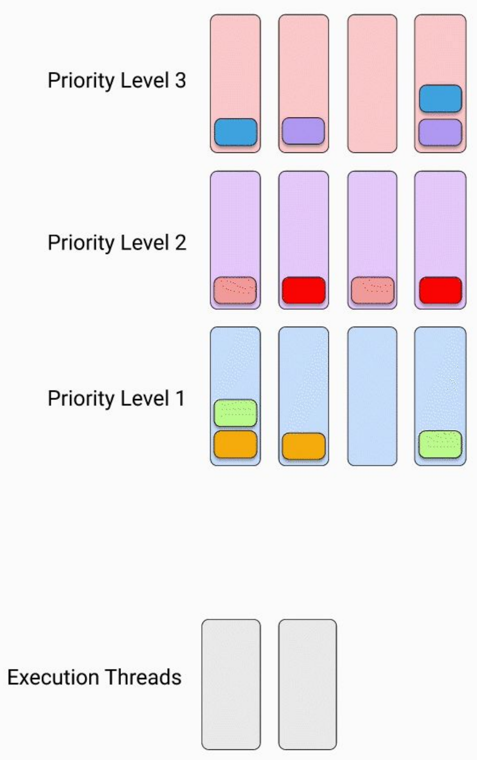
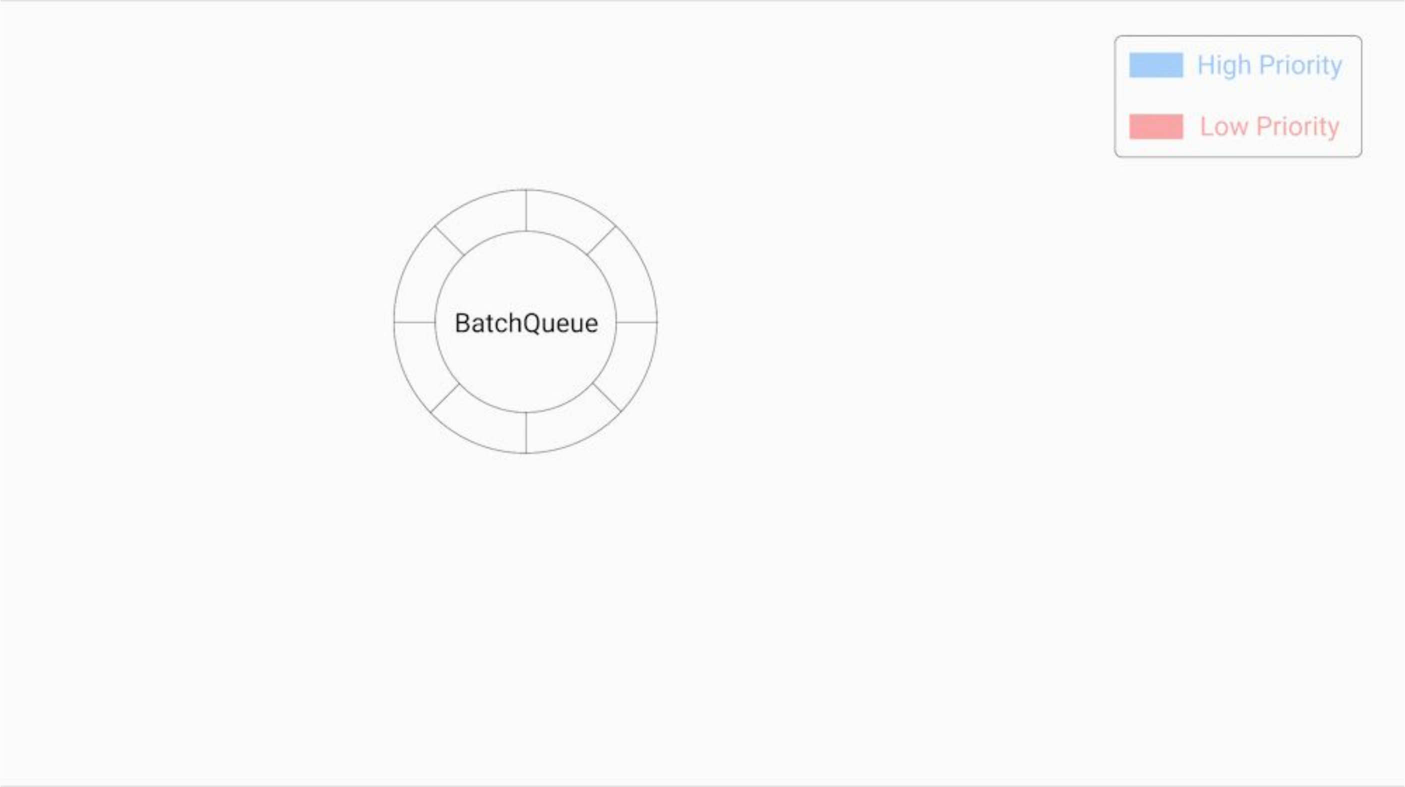
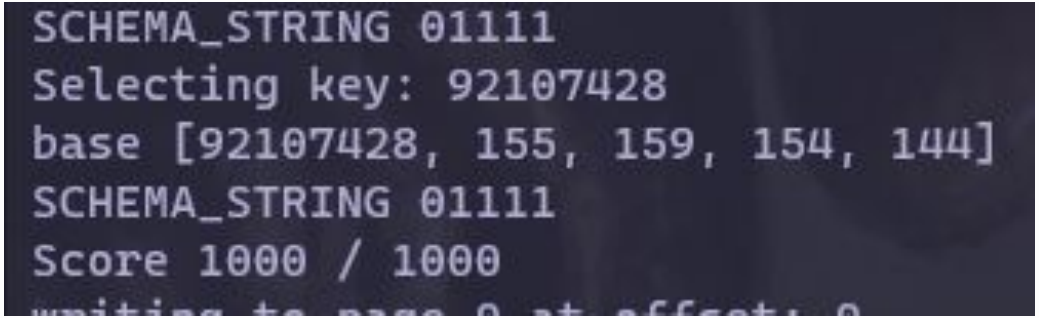
Execution Stage



Concurrent Batch Planning



Code Performance: Score



```
SCHEMA_STRING 01111
Selecting key: 92107428
base [92107428, 155, 159, 154, 144]
SCHEMA_STRING 01111
Score 1000 / 1000
writing to page 0 at offset: 0
```

02

Q/A

Questions about various aspects of the project

03

Demo

A live demonstration of the code