Zero-Downtime Schema Migrations at Scale

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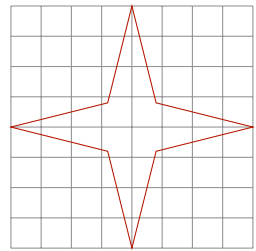
The problem

- Schema changes on a live, high-write table used to mean a maintenance window
- Maintenance windows are a support burden and a trust problem
- Goal: change any column, index or constraint with zero downtime

Our approach

- Dual-write to old and new schema
- Backfill in bounded batches
- Verify with a checksum pass
- Cut over reads, then drop the old column



Four-phase rollout

Example: adding a NOT NULL column

```
ALTER TABLE orders ADD COLUMN region TEXT;
UPDATE orders SET region = 'unknown'
  WHERE region IS NULL LIMIT 5000;
-- repeat in batches, then:
ALTER TABLE orders ALTER COLUMN region
  SET NOT NULL;
```

Results

- 340+ migrations run with this pattern since rollout
- Zero maintenance windows in the last 14 months
- Median migration time down from 40 minutes to 6 minutes