Chris Edwards
Zero Downtime Data Migrations
Continuous Delivery ≠ Continuous Deployment ≠ Zero Downtime Deployment
Continuous Delivery

Continuous Delivery is the ability to get changes of all types—including new features, configuration changes, bug fixes and experiments—into production, or into the hands of users, safely and quickly in a sustainable way.

https://continuousdelivery.com/
Continuous Deployment

Involves the actual *release* of changes into a production environment using no manual steps.
Zero Downtime Deployment

The release of changes to a production environment without disrupting users (actual humans or external systems)
15 Stations in and around Calgary

Stations hours: 6am–11pm MT
11pm Release

~ Once every two weeks
Scheduled Maintenance

✓ Kill server
✓ Migrate data
✓ Spin up new server
12,000 stations across Canada
Zero Downtime Deployments

- Database migrated
- New server spun up
- Approx 5 minutes passes
- Traffic routed to new server
- Old server receiving no traffic
- Old server killed
Two Minutes
Demo Time!

https://demo.chrisedwardsyyc.com
const counterSchema = new Schema({
    counter: {
        currentValue: Number
    }
})
class Counter {
    id;
    currentValue;

    constructor(id, count) {
        this.id = id;
        this.currentValue = count ?? 0;
    }

    static fromDoc(doc) {
        return new Counter(doc._id, doc.counter?.currentValue)
    }

    toDoc() {
        return { counter: { currentValue: this.currentValue } };
    }
}
async up(db, client) {
    await db.collection('counters').update(
        {}, {
            $rename: {'counter.currentValue': 'counter.newValue'}
        })
}
Zero Downtime Deployments

- Database migrated
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Multi-Step Migrations

Load Balancer

v1  v2  v3  v4
Rename – Step 1/3

- Variable saved to new name AND old name
- Server can read from new name AND old name
const counterSchema = new Schema({
  counter: {
    newValue: Number,
    newerValue: Number
  }
});
static fromDoc(doc) {
  const counterValue = doc.counter?.newValue ?? doc.counter?.newerValue;
  return new Counter(doc._id, counterValue)
}

toDoc() {
  return {
    counter: {
      newValue: this.currentValue,
      newerValue: this.currentValue
    }
  }
}
- Database migration to rename variable
- Server no longer saves to old name
- Server no longer reads from the new name
const counterSchema = new Schema({
  counter: {
    newValue: Number
  }
});
```javascript
static fromDoc(doc) {
    const counterValue = doc.counter?.newerValue;
    return new Counter(doc._id, counterValue);
}

toDoc() {
    return {
        counter: {
            newerValue: this.currentValue
        }
    };
}
```
async up(db, client) {
    await db.collection('counters').update(
        {}, {
            $rename: {'counter.newValue': 'counter.newerValue'}
        }
    )
}
Rename – Step 3/3

- Migration to remove old schema
async up(db, client) {
    await db.collection('counters').update({},
    [{ $unset: 'counter.newValue' }])
}
Migration Assessment

- Can data loss occur?
- Is there customer impact of data loss?
- Can it be easily repaired?
Is Zero-Downtime right for you?

- How many users do you have? Zero? 100? 10,000?
- How often do your users use your system?
- How critical is this system to their business (or yours?)
- What impact is the current deployment system having on your development team?
How we work
Test-Driven Development

- Red-green refactor
- Nearly 100% test server-side coverage
Test Pyramid Diamond

Test Pyramid – Mike Cohn, in his 2009 book Succeeding with Agile
Data Pipeline Tests

Prepoulated DB > Migrations > Report Queries
Trunk-Based Development

- No pull requests or feature branches
- Developers push to trunk 10+ times per day
- Trunk always in releasable state
Toggles/Cohorts/Dogfooding

- Release toggles to hide new functionality from customers
- Cohorts to release functionality incrementally
- Alpha cohort for extremely new or untested features
“Continuous” Deployment
You build it,
You run it
Questions?
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