



OVERVIEW & SETUP

CouchDB powerful database solution

```
# Install (Docker):
docker run -d --name mydb \
-e DB_PASSWORD=secret \
-p 5432:5432 couchdb:latest
```

Connect: host, port, user, password,
database name

INSTALLATION & CONFIG

```
# Package manager install
brew install couchdb
# Or download from official site
Config file: couchdb.conf or similar
Set max connections, memory, storage
paths
# Start service
systemctl start couchdb
```

DATA MODELING

Define schemas, tables/collections,
data types

```
-- Create table (SQL example):
CREATE TABLE users (
  id SERIAL PRIMARY KEY,
  name VARCHAR(100) NOT NULL,
  email VARCHAR(200) UNIQUE NOT NULL
);
```

Normalize for consistency;
denormalize for performance

CRUD OPERATIONS

```
-- INSERT
INSERT INTO users (name, email) VALUES
('Alice', 'a@b.com');
-- SELECT
SELECT * FROM users WHERE active = true;
-- UPDATE
UPDATE users SET name = 'Bob' WHERE id =
1;
-- DELETE
DELETE FROM users WHERE id = 1;
```

QUERYING

```
SELECT u.*, o.total
FROM users u
JOIN orders o ON o.user_id = u.id
WHERE o.status = 'paid'
ORDER BY o.created_at DESC
LIMIT 10 OFFSET 20;
```

Use EXPLAIN/EXPLAIN ANALYZE to
inspect query plans

INDEXING

```
CREATE INDEX idx_users_email ON
users(email);
CREATE UNIQUE INDEX
idx_users_email_unique ON users(email);
-- Composite index:
CREATE INDEX idx_orders ON
orders(user_id, status, created_at);
```

Index columns used in WHERE, JOIN,
ORDER BY clauses

Too many indexes slow writes
profile before adding

TRANSACTIONS

```
BEGIN;
UPDATE accounts SET balance = balance -
100 WHERE id = 1;
UPDATE accounts SET balance = balance +
100 WHERE id = 2;
COMMIT;
-- On error:
ROLLBACK;
```

ACID: Atomicity, Consistency,
Isolation, Durability

REPLICATION & HA

Primary-replica replication for read
scaling

```
# Primary: enable binary logging / WAL
# Replica: point to primary host
```

Automatic failover with
Patroni/Sentinel/etc

Read from replicas; write to primary
only

Monitor replication lag alert if >
threshold

SECURITY

Create least-privilege database
users

```
CREATE USER appuser WITH PASSWORD
'secret';
GRANT SELECT, INSERT, UPDATE ON users TO
appuser;
```

Enable SSL/TLS for connections in
transit

Encrypt sensitive columns at
application layer

Regular security updates and patches

MONITORING & PERF

Monitor query performance,
connections, disk I/O

```
-- Slow query log
SET log_min_duration_statement = 1000;
-- 1s
```

EXPLAIN ANALYZE for individual query
tuning

Connection pooling: PgBouncer,
ProxySQL, HikariCP

Vacuum/ANALYZE (PostgreSQL) or
OPTIMIZE (MySQL)

CLI / TOOLS

```
psql -h host -U user -d database
\l list databases \dt list tables
\d users describe table structure
-- Backup:
pg_dump dbname > backup.sql
-- Restore:
psql dbname < backup.sql
```

COMMON GOTCHAS

Never store plaintext passwords use
bcrypt/Argon2

Use connection pooling raw
connections are expensive

Always parameterize queries prevent
SQL injection

Regular backups with point-in-time
recovery

Test failover procedures before
production incidents