Introduction to

mongoDB

David Leger
Software Engineering (3rd year)

NoSQL Databases

key-value
- Amazon DynamoDB (Beta)
- ORACLE BERKELEY DB 11g
- redis

graph
- Neo4j the graph database
- InfiniteGraph
- sones

column
- HBASE
- riak
- Cassandra

document
- CouchDB relax
- mongoDB
- terrastore

What is MongoDB?

Nonrelational ("NoSQL") Database

Document Database

Useful For...

- JSON Web Services (RESTful APIs)
- Schemaless/Hierachical Data (Map Data)
- High Write Load (Real-time Data Collection)
- Table Sizes > 5-10GB

Comparing Data Structures

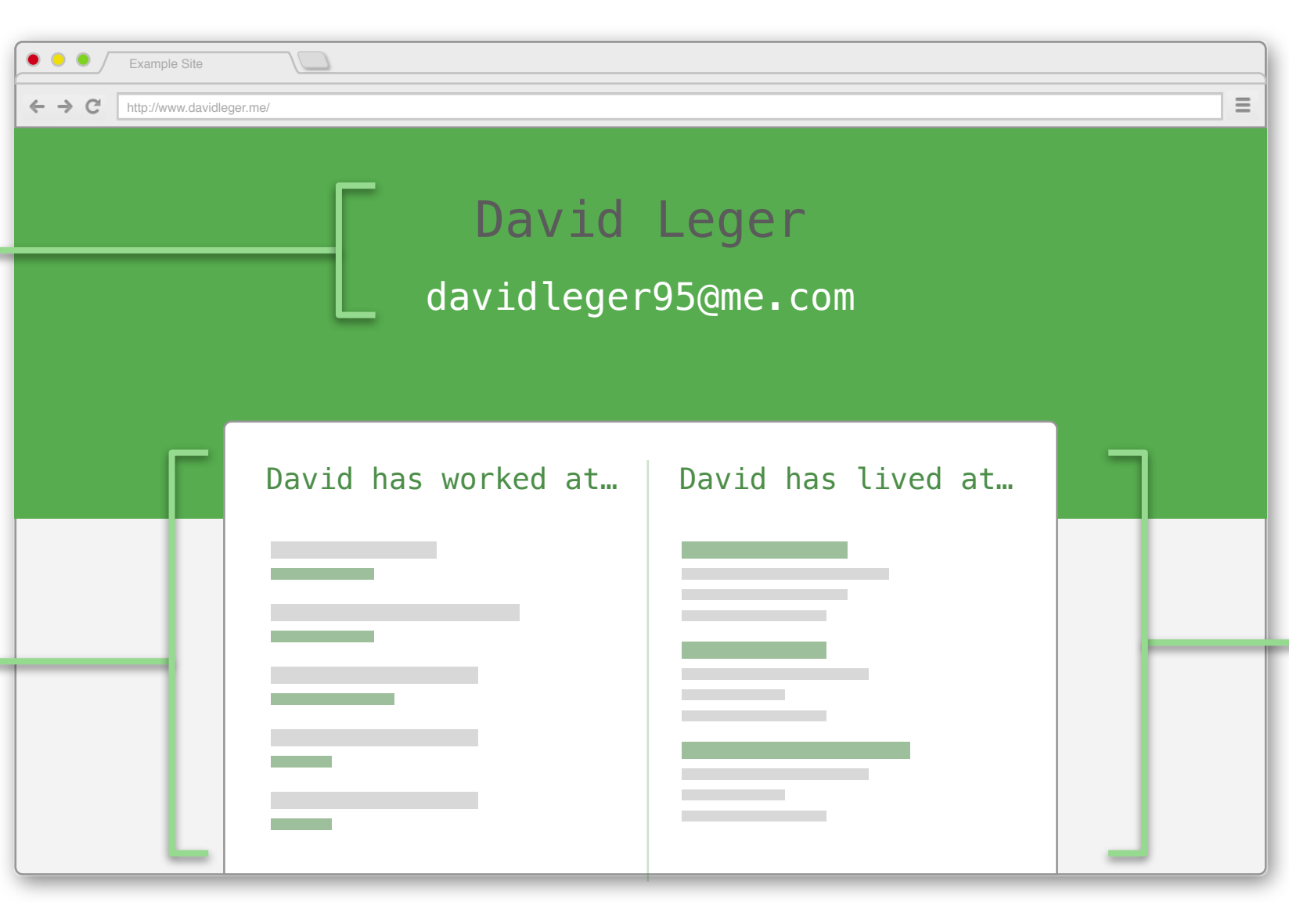
Relation vs Nonrelational

RDBMS:

```
USERS
+---------+-----------+-----------------------+--------+----------+-----+
| user_id | username  | email                 | fname  | lname    | age |
+---------+-----------+-----------------------+--------+----------+-----+
|       1 | dleger    | davidleger95@me.com   | David  | Leger    |  20 |
|       2 | sray      | sray@unb.ca           | Suprio | Ray      |  31 |
|       3 | wightman  | wightman@unb.ca       | Rick   | Wightman |  35 |
+---------+-----------+-----------------------+--------+----------+-----+

ADRESSES
+---------+---------+--------+-----------------+-------------+----------+
| addr_id | user_id | number | street          | city        | province |
+---------+---------+--------+-----------------+-------------+----------+
|       1 |       1 |    727 | Albert St       | Fredericton | NB       |
|       2 |       1 |     32 | Sprucewood Ave  | Rothesay    | NB       |
|       3 |       2 |    123 | Main St         | Fredericton | NB       |
|       4 |       3 |     34 | Raspberry Pi St| Rickland    | ON       |
|       5 |       3 |    292 | Queen St        | Fredericton | NB       |
|       5 |       1 |     12 | Smythe St       | Saint John  | NB       |
|       5 |       1 |     49 | Rue Notre-Dame  | Montreal    | QC       |
+---------+---------+--------+-----------------+-------------+----------+

EMPLOYMENT_HISTORY
+-------------+-------+----------------------+------------+----------+
|employment_id|user_id| employer             | start_year | end_year |
+-------------+-------+----------------------+------------+----------+
|           1 |     3 | ACOA                 |       2006 |     2007 |
|           1 |     1 | Mariner Innovations  |       2014 |     2014 |
|           1 |     2 | Oracle               |       NULL |     NULL |
|           1 |     2 | UNB, FCS             |       2015 |     NULL |
|           1 |     3 | UNB, FCS             |       2000 |     NULL |
|           1 |     1 | UNB, F-Educ.         |       2015 |     2015 |
|           1 |     1 | UNB, ALC             |       2015 |     NULL |
|           1 |     1 | Atlantic Football    |       2015 |     NULL |
|           1 |     1 | CS Square            |       2015 |     NULL |
|           1 |     3 | Disney               |       NULL |     NULL |
+-------------+-------+----------------------+------------+----------+
```



Requires 3 Queries in SQL

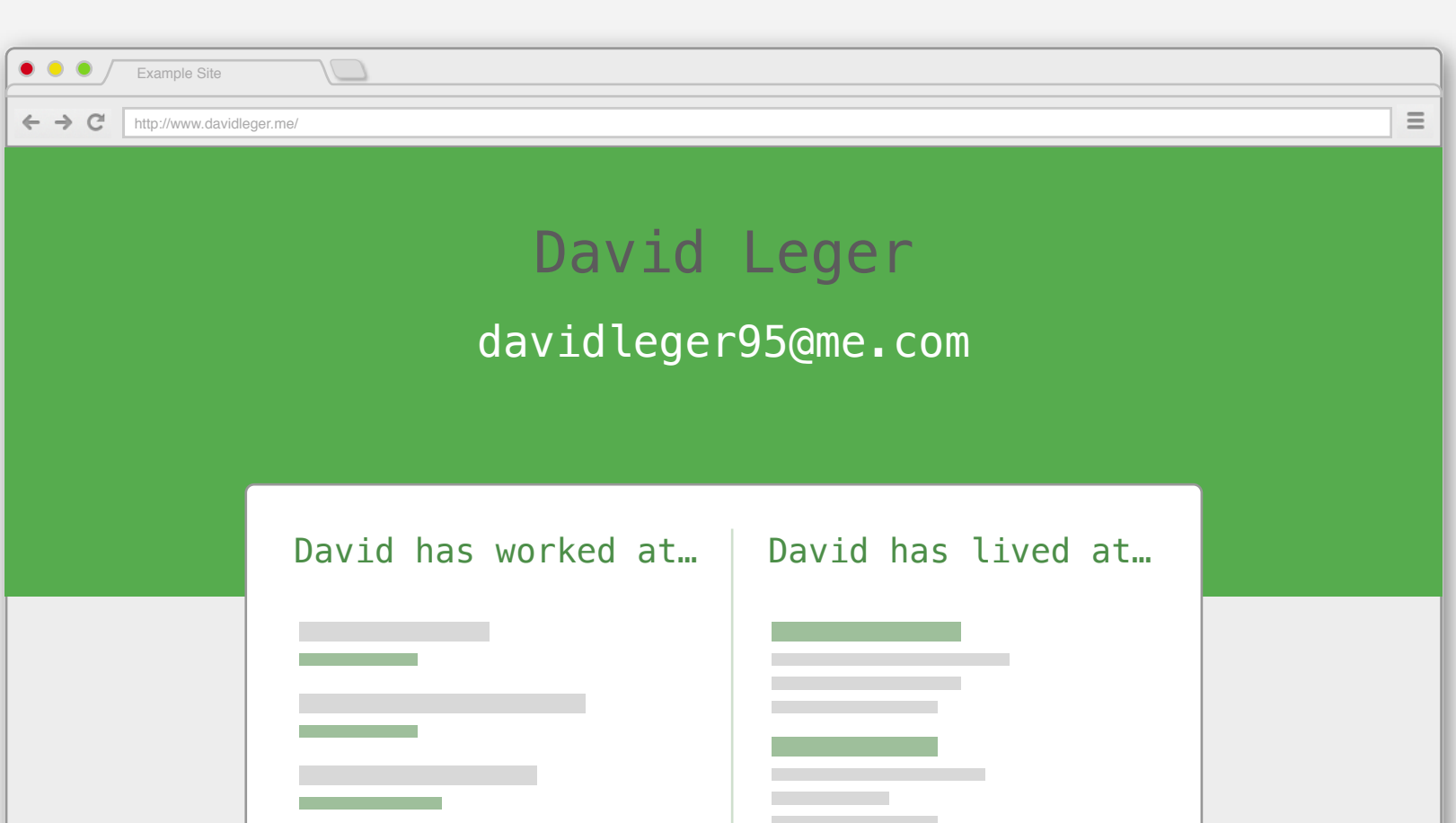
```
SELECT * FROM USERS WHERE user_id = 1;
SELECT * FROM ADRESSES WHERE user_id = 1;
SELECT * FROM EMPLOYMENT_HISTORY WHERE user_id = 1;
```

MongoDB:

users

```
{
   "_id" : ObjectId("509a8fb2f3f4948bd2f983a0"),
   "user_id": 1,
   "age": 20,
   "email": "davidleger95@me.com",
   "name": {
      "first": "David",
      "last": "Leger"
   },
   "username": "dleger",
   "addresses": [
      {
         "number": 727,
         "street": "Albert St",
         "city": "Fredericton",
         "province": "NB"
      },
      {
         "number": 32,
         "street": "Sprucewood Ave",
         "city": "Rothesay",
         "province": "NB"
      },
      {
         "number": 49,
         "street": "Rue Notre Dame",
         "city": "Montreal",
         "province": "QC"
      },
      {
         "number": 12,
         "street": "Smythe St",
         "city": "Saint John",
         "province": "NB"
      }
   ],
   "employmentHistory": [
      {
         "employer": "Mariner Innovations",
         "startYear": 2014,
         "endYear": 2014
      },
      {
         "employer": "UNB F-Educ.",
         "startYear": 2015,
         "endYear": 2015
      },
      {
         "employer": "UNB ALC",
         "startYear": 2015
      },
      {
         "employer": "Atlantic Football League",
         "startYear": 2015
      },
      {
         "employer": "CS Square",
         "startYear": 2015
      }
   ]
}

// data omitted...
```



Requires Just 1 Query in MongoDB

```
db.users.find({ _id: 1 })
```

More Query Examples...

Specific Fields

```
db.users.find(  // SELECT FROM
    { user_id: 1 }, // WHERE
    { _id: 0,       // fields
      user_id: 1,
      name: 1,
      email: 1
    }
)
```

```
SELECT user_id, fname, lname, email
FROM USERS
WHERE user_id = 1;
```

Embedded Documents vs. Relations

```
db.users.find(  // SELECT FROM
    { adresses: {   // WHERE
        $elemMatch: {
          employer: 'UNB FCS'
        }
      }
    },
    { _id: 0,        // fields
      name: 1,
      adresses: 1
    }
)
```

```
SELECT *
FROM ADRESSES,
WHERE employer = 'UNB FCS';

SELECT fname, lname
FROM USERS,
WHERE employer = 'UNB FCS';
```

Embedded Documents vs. Relations (2)

```
db.users.find(   // SELECT FROM
    { age:{ $gt: 25 }},// WHERE
    { _id: 0,          // fields
      employmentHistory: 1
    }
)
```

```
SELECT e.employer, e.start_year,
e.end_year
FROM USERS u, EMPLOYMENT_HISTORY e,
WHERE u.user_id = e.user_id AND
u.age > 25;
```

Other Aggregation Pipeline Operators...

https://docs.mongodb.org/manual/reference/operator/aggregation/

Language Support

Documentation	Releases	Source	API	JIRA	Online Course
C	Releases	Source	API	JIRA	
C++	Releases	Source	API	JIRA	
C#	Releases	Source	API	JIRA	Course
Java	Releases	Source	API	JIRA	Course
Node.js	Releases	Source	API	JIRA	Course
Perl	Releases	Source	API	JIRA	
PHP	Releases	Source	API	JIRA	
Python	Releases	Source	API	JIRA	Course
Motor	Releases	Source	API	JIRA	
Ruby	Releases	Source	API	JIRA	
Scala	Releases	Source	API	JIRA	

https://docs.mongodb.org/ecosystem/drivers/

MongoDB University

Schedule

Course	Start	End	Level	Register
M101P: MongoDB for Developers	Jan 05, 2016	Mar 01, 2016	Introductory	Register
M101J: MongoDB for Java Developers	Jan 05, 2016	Mar 01, 2016	Introductory	Register
M101JS: MongoDB for Node.js Developers	Jan 05, 2016	Mar 01, 2016	Introductory	Register
M101N: MongoDB for .NET Developers	Jan 05, 2016	Mar 01, 2016	Introductory	Register
M102: MongoDB for DBAs	Jan 05, 2016	Mar 01, 2016	Introductory	Register
M202: MongoDB Advanced Deployment and Operations	Jan 05, 2016	Mar 01, 2016	Advanced	Register
UD032: Data Wrangling with MongoDB (Udacity)	N/A	N/A	Intermediate	Register
M101X: Introduction to MongoDB using the MEAN Stack (edX)	N/A	N/A	Intermediate	Register

https://university.mongodb.com/courses

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www.davidleger.me | davidleger95@me.com