GraphQL APIs for Gateways

- Query language and runtime
- Facebook tech
- MIT-licensed
- ~~Better~~ *Different* approach to API design

Query Language: Intro

- SQL, Xpath, Gremlin, etc
- Example schema:

users

name	org	...
Sally	Cyberdyne Systems	...
Ada	Cyberdyne Systems	...

groups

name	title	...
UX	User experience working group	...
ML	Machine learning engineers	...

projects

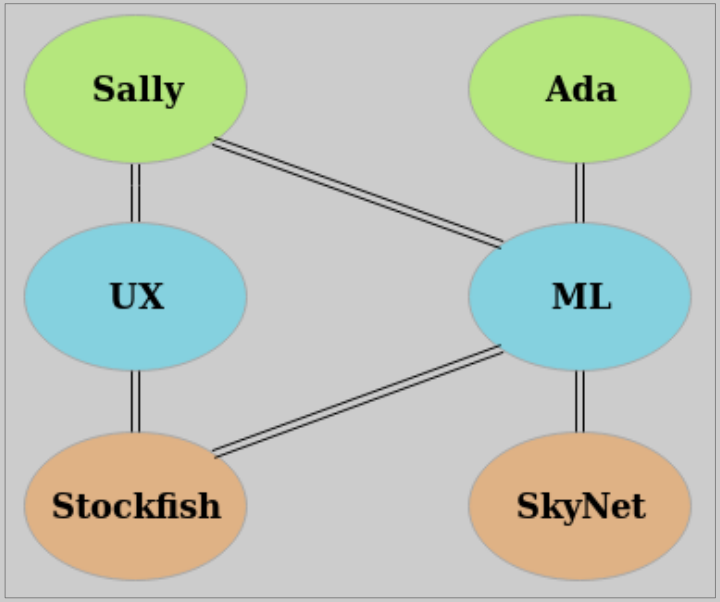
name	alignment	...
SkyNet	chaotic neutral	...
Stockfish	lawful neutral	...

group_user_rel

group	user
UX	Sally
ML	Sally
ML	Ada

project_group_rel

project	group
Stockfish	UX
Skynet	ML
Stockfish	ML

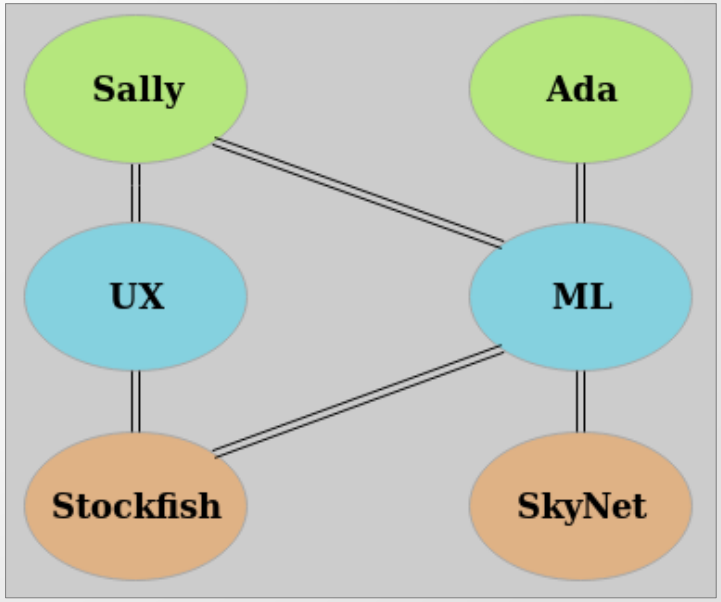


Query Language: Example SQL

- Summarize the effort behind Stockfish

```
SELECT u.name, u.org, array_agg(pg.group_name) AS groups
FROM project_group_rel pg
LEFT JOIN group_user_rel gu ON gu.group_name = pg.group_name
INNER JOIN users u ON u.name = gu.user_name
WHERE project_name = 'Stockfish'
GROUP BY u.name, u.org;
```

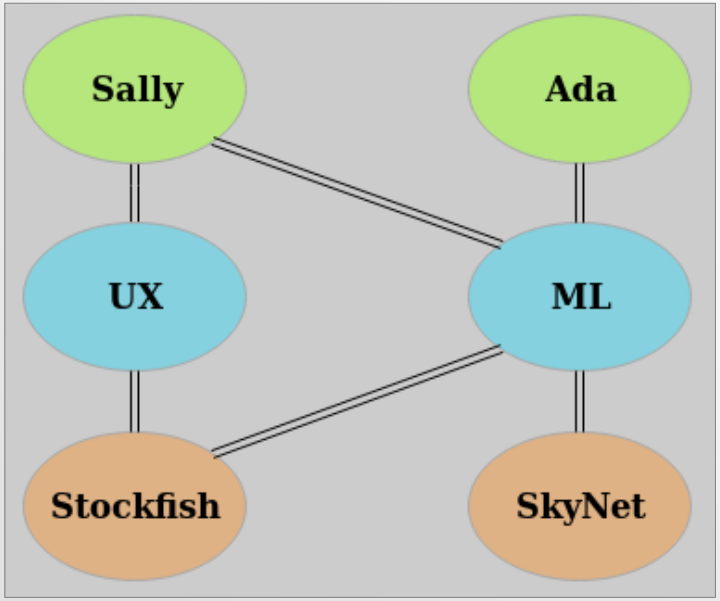
```
 name  |         org          | groups
-------+----------------------+---------
 Ada   | Cyberdyne Systems | {ML}
 Sally | Cyberdyne Systems | {UX,ML}
```



Query Language: Example GraphQL

- Summarize the effort behind Stockfish

```
In:
{
  projects(name: “Stockfish”) {
    groups {
      name
      users { name org }
    }
  }
}
```



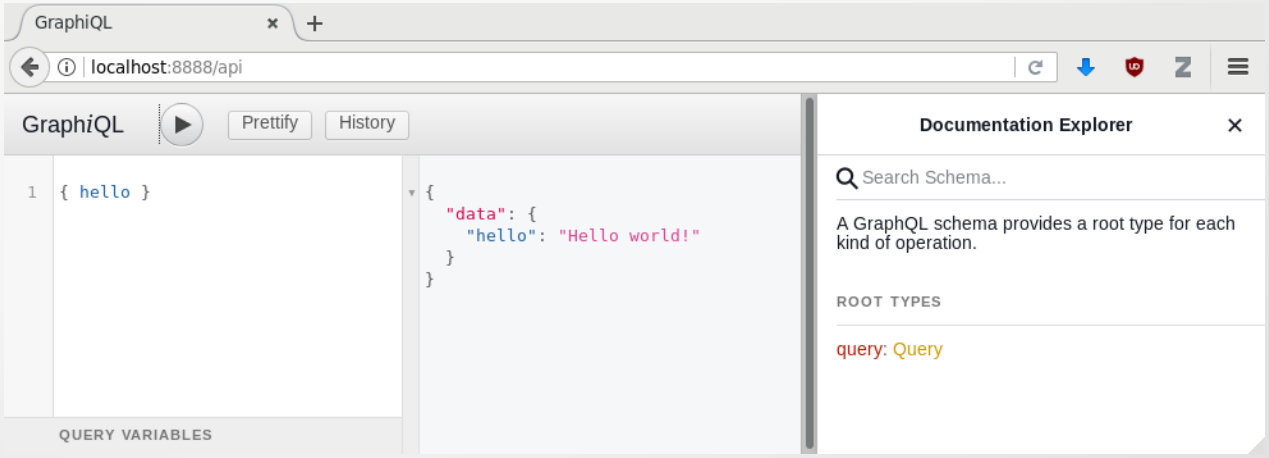

```
Out:
{
  ”project”: {
    “groups”: [
      {
        ”name”: “ML”,
        ”users”: [
          {
            ”name”: “Ada”,
            ”org”: “Cyberdyne Systems”
              },
          {
            “name”: “Sally”,
            “org”: “Cyberdyne Systems”
              }
        ]
      },
      {
        ”name”: “UX”,
        ”users”: [
          {
            “name”: “Sally”,
            “org”: “Cyberdyne Systems”

/* … various closing brackets ... */
```

Query Language: Type System

- Server:

```
type Project {
    name: String!
    alignment: Alignment!
    groups: [Group]!
}
type Group {
    name: String!
    title: String!
    projects: [Project]!
    users: [User]!
}
type User {
    name: String!
    org: String!
    groups: [Group]!
}
enum Alignment {
    lawful good
    neutral good
    ... etc
}
```

```
type Query {
    project(name: String!): Project
    projects(): [Project]!
    group(name: String!): Group
    groups(): [Group]!
    user(name: String!): User
    users(): [User]!
}
```



Runtime: vs. REST

- REST

```
GET /projects/Stockfish/groups
for $groupURL in groups:
    GET $groupURL/users
    for $userURL in $users:
        GET $userURL
```

```
/projects
/projects/$name
/projects/$name/groups
/groups
/groups/$name
/groups/$name/users
/users
/users/$name
/users/$name/groups
```

- GraphQL

```
GET /graphql?query={
  projects(name: “Stockfish”) {
    groups {
      name
      users { name org }
    }
  }
}
```

```
type Query {
    project(name: String!): Project
    projects(): [Project]!
    group(name: String!): Group
    groups(): [Group]!
    user(name: String!): User
    users(): [User]!
}
```

Runtime: vs. REST

- REST

```
GET /projects/Stockfish/groups
for $groupURL in groups:
    GET $groupURL/users
    for $userURL in $users:
        GET $userURL
```

  - GET /projects/Stockfish/summary
  - GET /projects/Stockfish
    ?include=groups,users

- GraphQL

```
GET /graphql?query={
  projects(name: “Stockfish”) {
    groups {
      name
      users { name org }
    }
  }
}
```

```
/projects
/projects/$name
/projects/$name/groups
/projects/$name/summary
/groups
/groups/$name
/groups/$name/users
/users
/users/$name
/users/$name/groups
```

```
type Query {
    project(name: String!): Project
    projects(): [Project]!
    group(name: String!): Group
    groups(): [Group]!
    user(name: String!): User
    users(): [User]!
}
```

Runtime: vs. REST

- REST

```
GET /projects/Stockfish/groups
for $groupURL in groups:
    GET $groupURL/users
    for $userURL in $users:
        GET $userURL
```

  - GET /projects/Stockfish/summary
  - GET /projects/Stockfish
    ?include=groups,users
  - GET /projects/Stockfish/related

- GraphQL

```
GET /graphql?query={
  projects(name: “Stockfish”) {
    groups {
      name
      users { name org }
      projects { name }
    }
  }
}
```

```
/projects
/projects/$name
/projects/$name/groups
/projects/$name/summary
/projects/$name/related
/groups
/groups/$name
/groups/$name/users
/users
/users/$name
/users/$name/groups
```

```
type Query {
    project(name: String!): Project
    projects(): [Project]!
    group(name: String!): Group
    groups(): [Group]!
    user(name: String!): User
    users(): [User]!
}
```

Agility & Expressiveness, at a price

- Pros
  - Responds well to requirement change
  - Less dependency between front- and back-end teams
  - Supports multiple consumer types readily
  - Consistent
  - Less latency
- Cons
  - Non-standard
  - a e s t h e t i c
  - More latency
  - “Production-izing” more costly

.