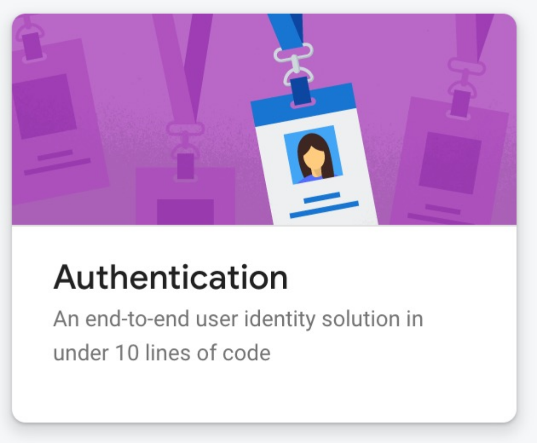
Mobile Applications
CSCI 448
Lecture 29

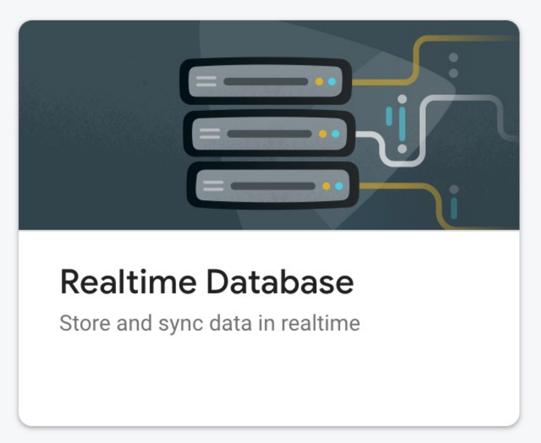
Firebase

User Authentication + Cloud Database



Authentication

An end-to-end user identity solution in under 10 lines of code



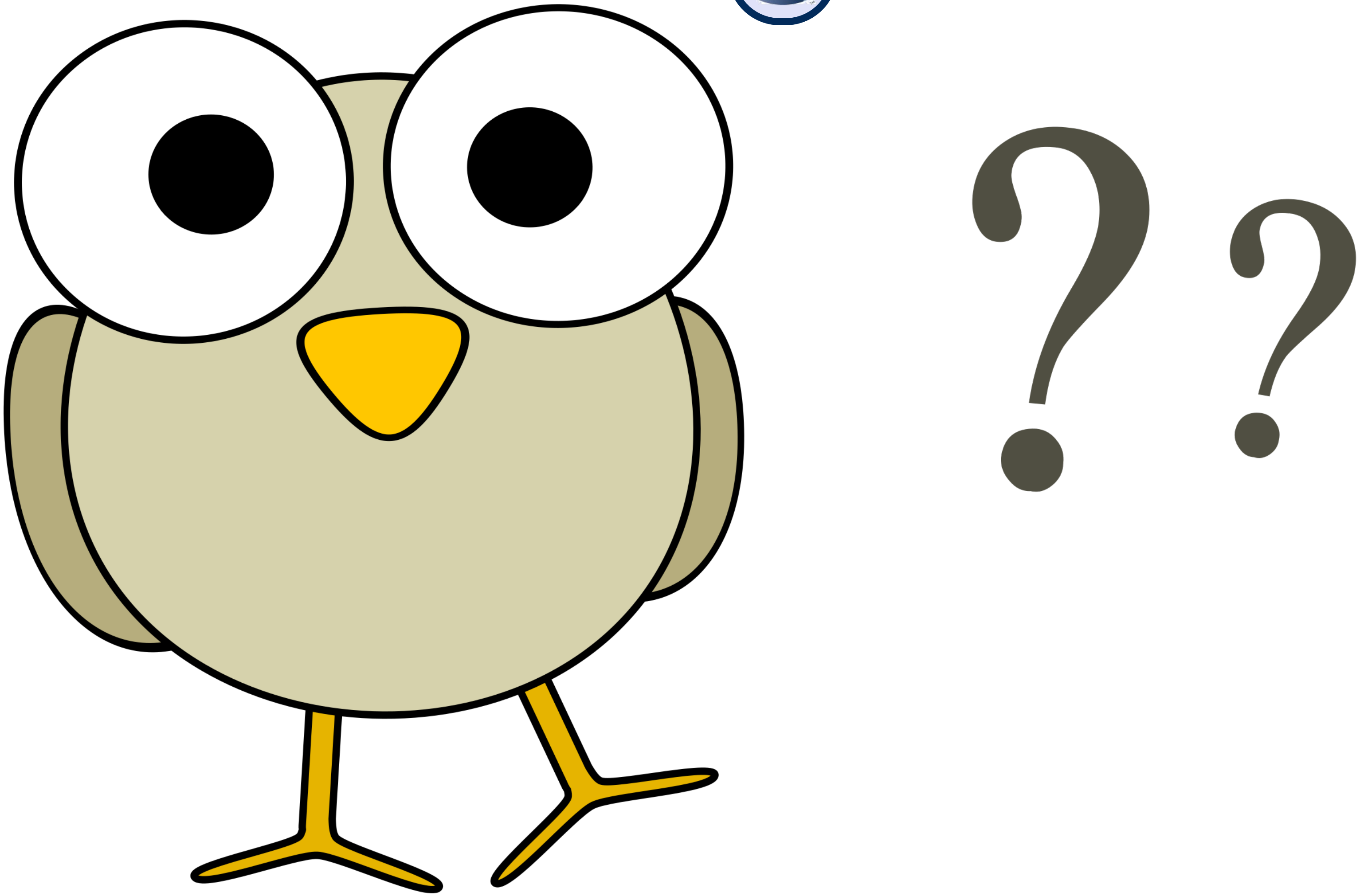
Realtime Database

Store and sync data in realtime

Previously in CSCI 448

- Maps
  - Need to get API key → put in local.settings
  - Call GoogleMap() composable
  - Add Marker() composables

Questions?



Learning Outcomes For Today

- Discuss Firebase support for user authentication and cloud databases

On Tap For Today

- Firebase Authentication
- Firebase Realtime Database

On Tap For Today

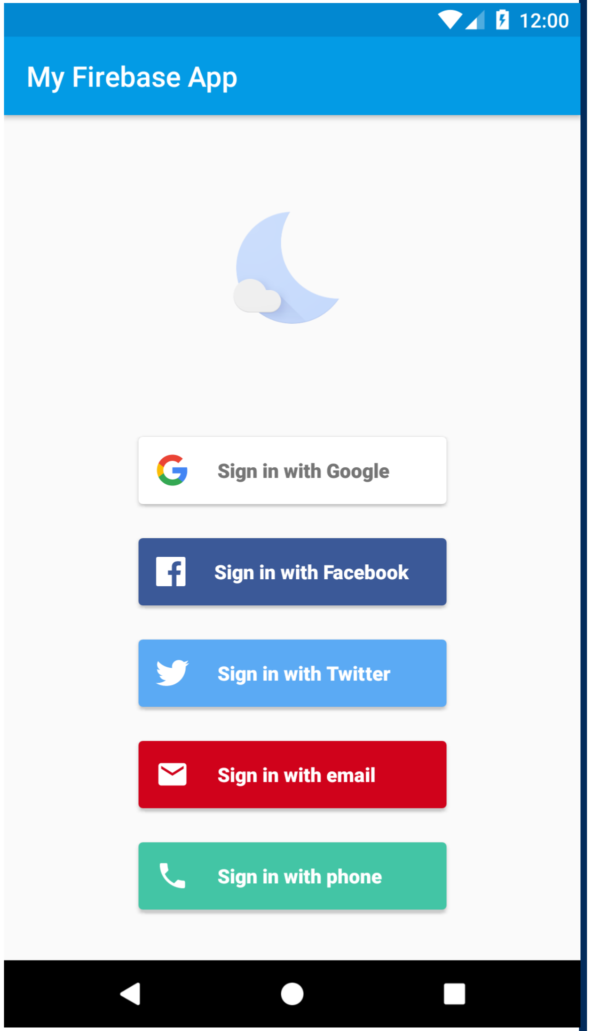
- Firebase Authentication
- Firebase Realtime Database

Use Pre-Built UI

1. Create ActivityResultLauncher
2. Specify sign-in methods
3. Launch login
4. Receive result
   - Success – signed in
   - Failure – get error for reason

...sometime later...

1. Sign out



Additionally

- Can register new users
- Get users name, email, photo
- Can send users verification email
- Manage user profiles

- Possible to enable MFA
- See https://firebase.google.com/docs/auth/android/firebaseui?hl=en&authuser=0

On Tap For Today

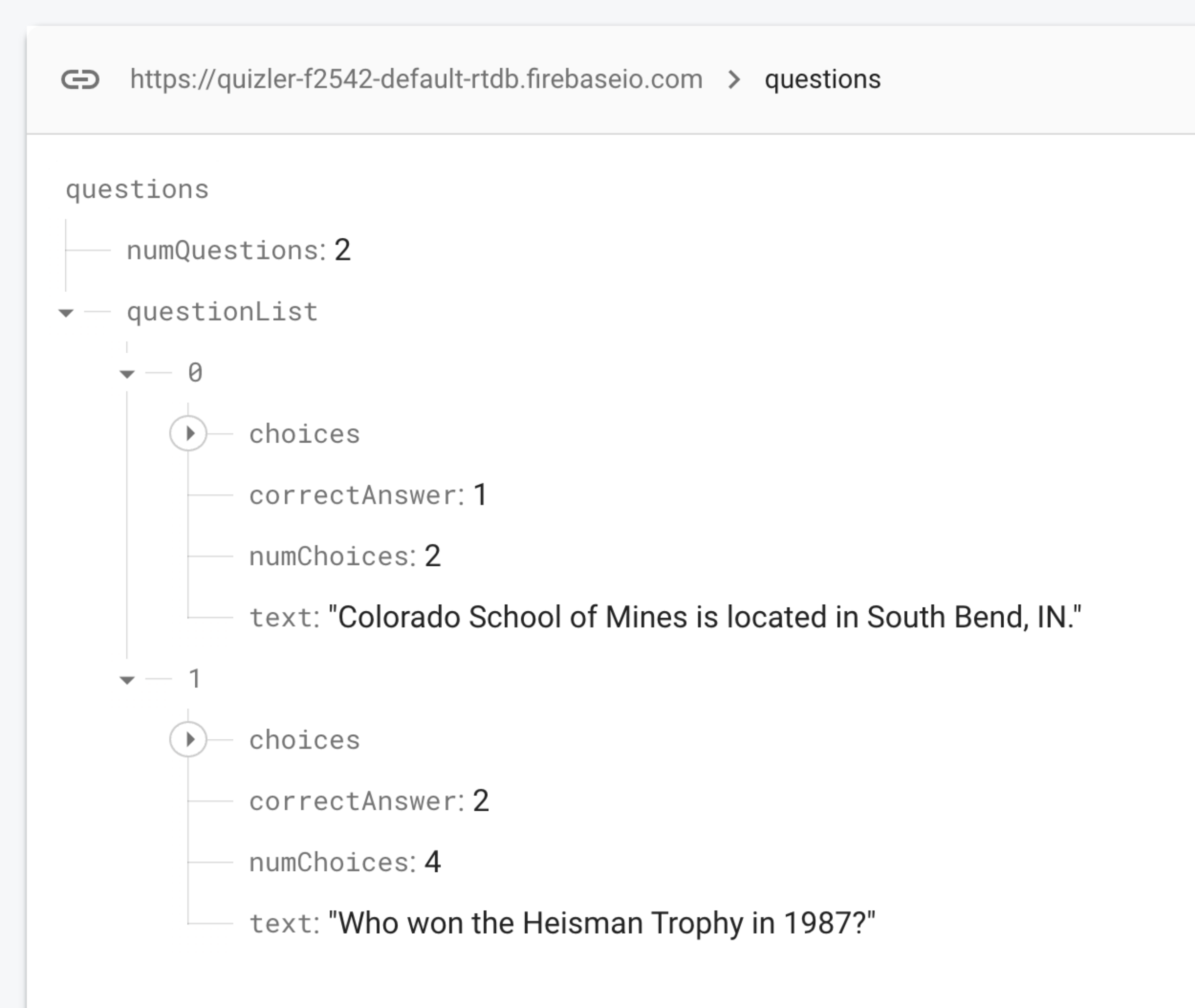
- Firebase Authentication
- Firebase Realtime Database

Free Tier

- 100 simultaneous connections
- 1GB data
- 1 database per project

NoSQL Database

- Specify as JSON Tree

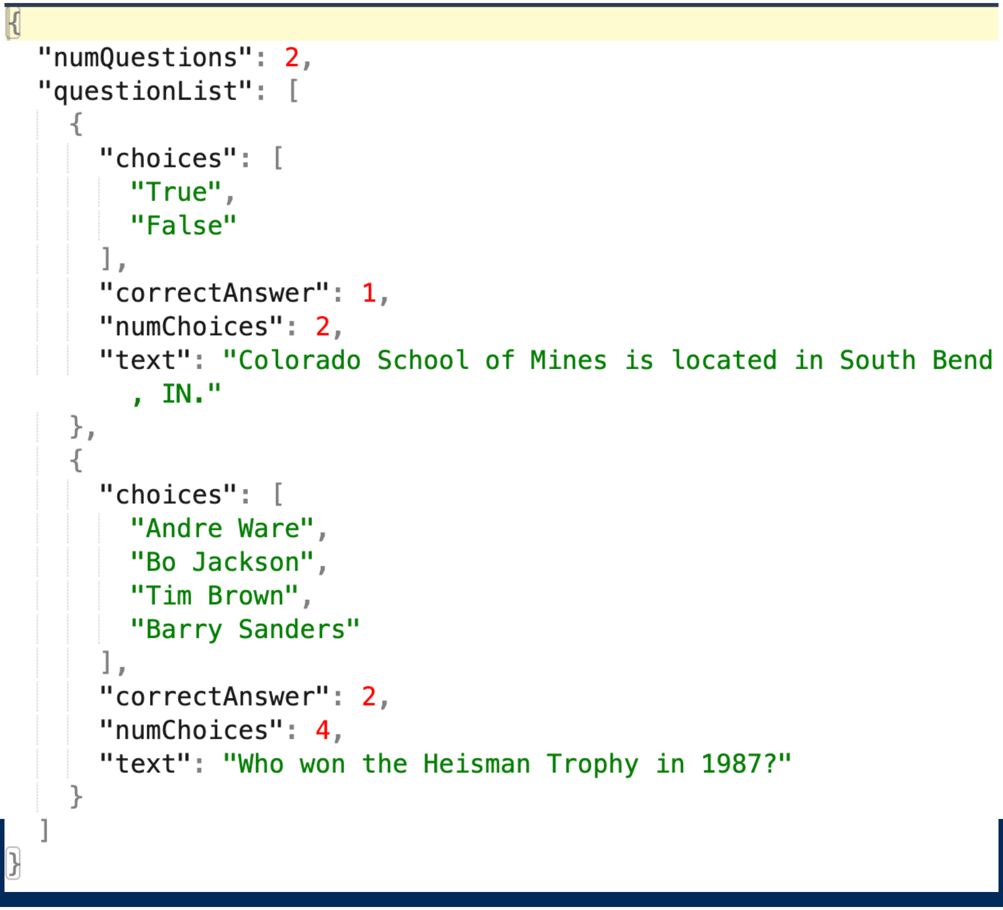


https://quizler-f2542-default-rtdb.firebaseio.com > questions

```
questions
├── numQuestions: 2
└── questionList
    ├── 0
    │   ├── choices
    │   ├── correctAnswer: 1
    │   ├── numChoices: 2
    │   └── text: "Colorado School of Mines is located in South Bend, IN."
    └── 1
        ├── choices
        ├── correctAnswer: 2
        ├── numChoices: 4
        └── text: "Who won the Heisman Trophy in 1987?"
```

Access Via REST API

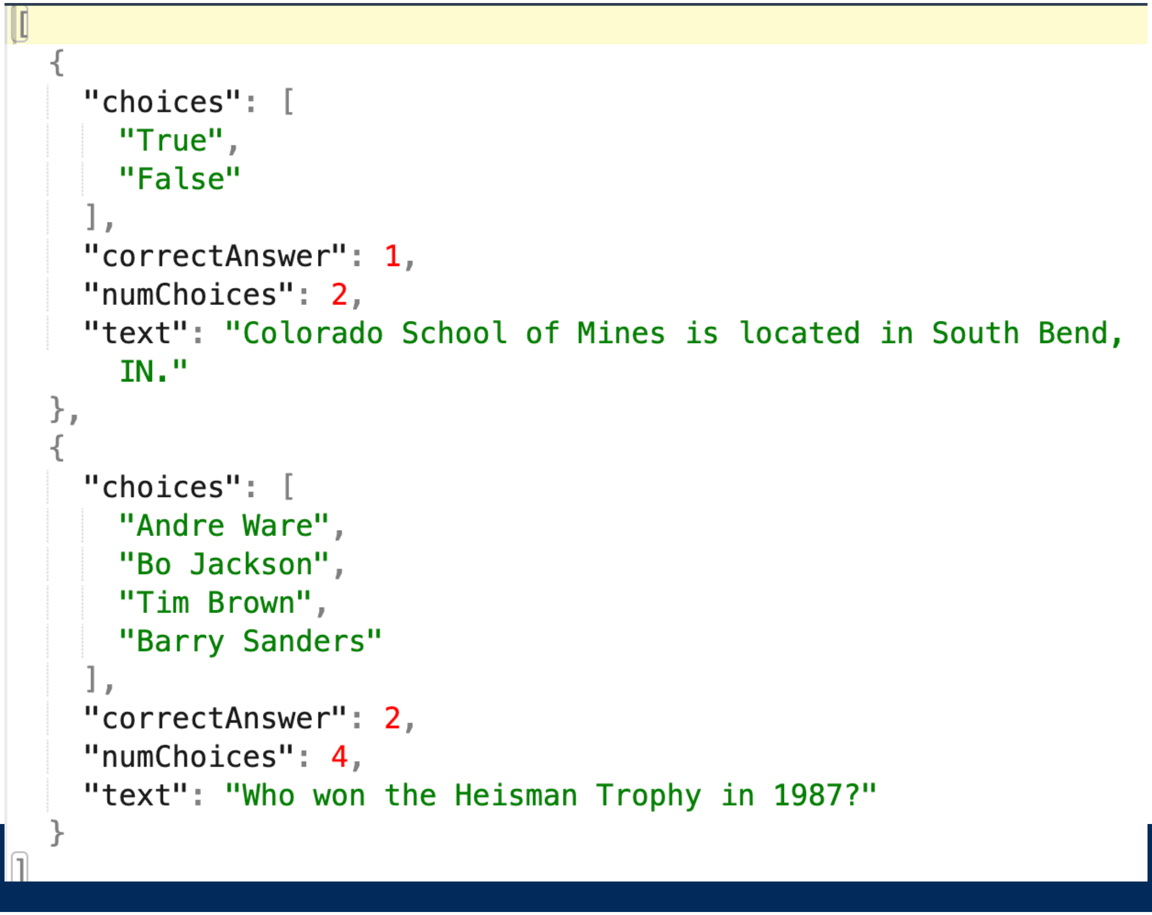
- GET https://quizler-f2542-default-rtdb.firebaseio.com/questions.json



```
{
  "numQuestions": 2,
  "questionList": [
    {
      "choices": [
        "True",
        "False"
      ],
      "correctAnswer": 1,
      "numChoices": 2,
      "text": "Colorado School of Mines is located in South Bend
        , IN."
    },
    {
      "choices": [
        "Andre Ware",
        "Bo Jackson",
        "Tim Brown",
        "Barry Sanders"
      ],
      "correctAnswer": 2,
      "numChoices": 4,
      "text": "Who won the Heisman Trophy in 1987?"
    }
  ]
}
```

Access Via REST API

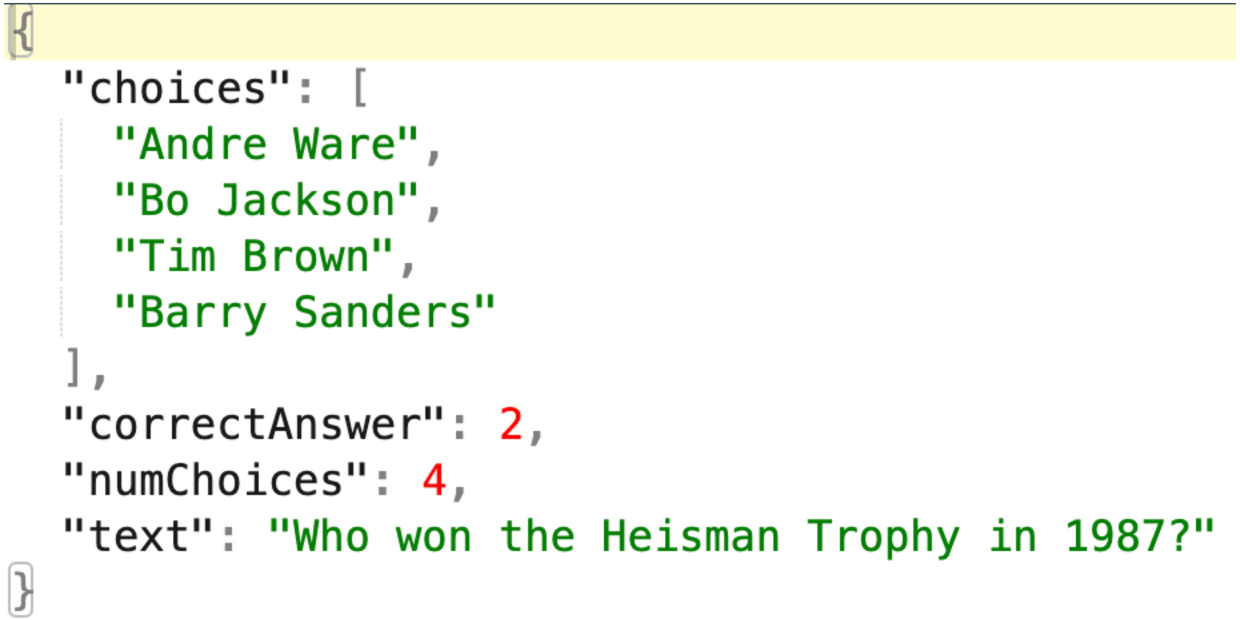
- GET https://quizler-f2542-default-rtdb.firebaseio.com/questions/questionList.json



```
[
  {
    "choices": [
      "True",
      "False"
    ],
    "correctAnswer": 1,
    "numChoices": 2,
    "text": "Colorado School of Mines is located in South Bend,
      IN."
  },
  {
    "choices": [
      "Andre Ware",
      "Bo Jackson",
      "Tim Brown",
      "Barry Sanders"
    ],
    "correctAnswer": 2,
    "numChoices": 4,
    "text": "Who won the Heisman Trophy in 1987?"
  }
]
```

Access Via REST API

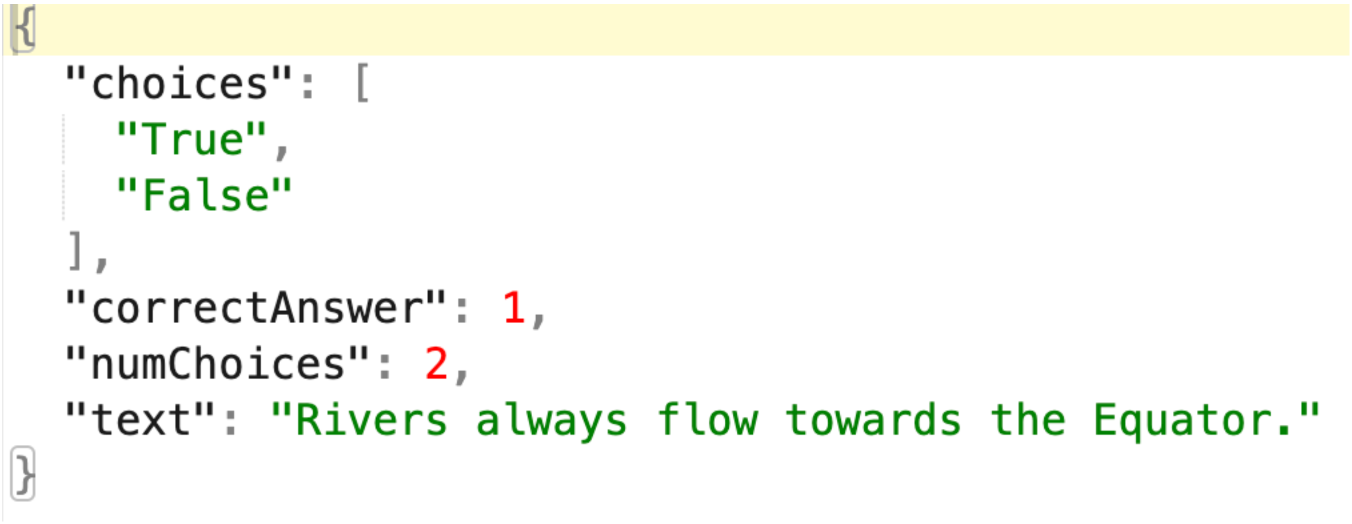
- GET https://quizler-f2542-default-rtdb.firebaseio.com/questions/questionList/1.json



```
{
  "choices": [
    "Andre Ware",
    "Bo Jackson",
    "Tim Brown",
    "Barry Sanders"
  ],
  "correctAnswer": 2,
  "numChoices": 4,
  "text": "Who won the Heisman Trophy in 1987?"
}
```

Append to List

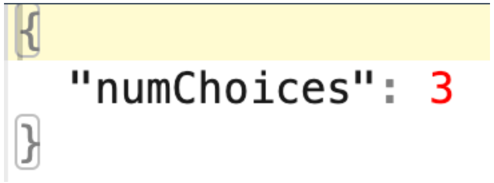
- PUT https://quizler-f2542-default-rtdb.firebaseio.com/questions/questionList/2.json



```
{
  "choices": [
    "True",
    "False"
  ],
  "correctAnswer": 1,
  "numChoices": 2,
  "text": "Rivers always flow towards the Equator."
}
```

Update an Entity

- PATCH https://quizler-f2542-default-rtdb.firebaseio.com/questions.json



```
{
  "numChoices": 3
}
```

REST API

- Access via Retrofit Library
- See more specifics: https://firebase.google.com/docs/database/rest/start?hl=en&authuser=0
- However…

Three REST Concerns

1. Authentication Tokens
2. Only works online
   - Need manual Room DB cache to sync
3. Updating
   - PUT
     - Refers to an entity, not a collection
     - The entity is complete
       - So if it contains a collection...
   - PATCH
     - Update a member of an entity
     - Not idempotent!

Android API

- See https://firebase.google.com/docs/database/android/start?hl=en&authuser=0

1. Uses Token to authenticate
2. When offline, persists data & queues transactions
3. Can perform multiple updates simultaneously

Working With Database

- Get database reference

```
private lateinit var database: DatabaseReference
// ...
database = Firebase.database.reference
```

- Get node reference

```
val questionRef = database.child("questions")
val questionListRef = questionRef.child("questionList")
```

- Write new data

```
questionRef.child("numQuestions").setValue(4)
```

- Get data once

```
questionListRef.get().addOnSuccessListener { questionList -> // List<Question>
  // ...
}.addOnFailureListener {
  Log.e(LOG_TAG, "Error", it)
}
```

Working With Database

- Or listen for updates

```
private lateinit var database: DatabaseReference
// ...
database = Firebase.database.reference
val questionListRef = database.child("questions").child("questionList")

questionListRef.addValueEventListener( object : ValueEventListener {
  override fun onDataChange(dataSnapshot: DataSnapshot) {
    val questionList = dataSnapshot.getValue<List<Question>>()
    // ...
  }
  override fun onCancelled(databaseError: DatabaseError) {
    Log.w(LOG_TAG, "loadQuestions:onCancelled", databaseError.toException())
  }
})
```