AWS re:Invent

NOV. 29 – DEC. 3, 2021 | LAS VEGAS, NV

OPN204

Introduction to GraphQL

Robert Zhu
Principal Developer Advocate
Amazon Web Services

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Agenda

- What is GraphQL?
- History of GraphQL
- Comparing GraphQL to REST
- The three superpowers of GraphQL
- Authentication and authorization
- When to use GraphQL
- How to take GraphQL into production

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

What is GraphQL?

- Request (GraphQL doc) → Response (JSON)
- Language specification
- Schema (domain-specific)
- Server implementation

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

GraphQL is NOT

- A client-side state management solution
- A solution for binary streams
- Facebook Graph API
- Limited to specific database(s)
- Limited to JavaScript/NodeJS on the backend
- Limited to use with React/Relay/web
- Limited to HTTP

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

GraphQL operations

- Query (read)
- Mutation (write)
- Subscription

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Query structure

```
query GetBooksForAuthor($id: ID!) {
  author(id: $id) {
    givenName,
    nationality,
    books {
      title
      isbn
    }
  }
}
```

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Query structure

```
query GetBooksForAuthor($id: ID!) {
  author(id: $id) {
    givenName,
    nationality,
    books {
      title
      isbn
    }
  }
}
```

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Query structure

```
query GetBooksForAuthor($id: ID!) {
  author(id: $id) {
    givenName,
    nationality,
    books {
      title
      isbn
    }
  }
}
```

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Query structure

```
query GetBooksForAuthor($id: ID!) {
  author(id: $id) {
    givenName,
    nationality,
    books {
      title
      isbn
    }
  }
}
```

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Query structure

```
query GetBooksForAuthor($id: ID!) {
  author(id: $id) {
    givenName,
    nationality,
    books {
      title
      isbn
    }
  }
}
```

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Query structure

```
query GetBooksForAuthor($id: ID!) {
  author(id: $id) {
    givenName,
    nationality,
    books {
      title
      isbn
    }
  }
}
```

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Query structure

```
query GetBooksForAuthor($id: ID!) {
  author(id: $id) {
    givenName,
    nationality,
    books {
      title
      isbn
    }
  }
}
```

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

History of GraphQL

2012 – Built to support Facebook mobile apps

2015 – GraphQL open-sourced

2018 – GraphQL Foundation

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

GraphQL vs. REST

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

API technologies

- REST
- SOAP
- gRPC
- Apache Thrift
- OpenAPI/Swagger
- JSON-LD
- HAL
- OData
- . . . and more

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

REST

GraphQL

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

	REST	GraphQL
Shared definition	No	Yes

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

	REST	GraphQL
Shared definition	No	Yes
Conceptual model	Resources	Graphs

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

	REST	GraphQL
Shared definition	No	Yes
Conceptual model	Resources	Graphs
Organization	Federated	Centralized

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

	REST	GraphQL
Shared definition	No	Yes
Conceptual model	Resources	Graphs
Organization	Federated	Centralized
Related operations	Yes	No

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

	REST	GraphQL
Shared definition	No	Yes
Conceptual model	Resources	Graphs
Organization	Federated	Centralized
Related operations	Yes	No
Introspection	No	Yes

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

	REST	GraphQL
Shared definition	No	Yes
Conceptual model	Resources	Graphs
Organization	Federated	Centralized
Related operations	Yes	No
Introspection	No	Yes
Data typing	Weak	Strong

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

	REST	GraphQL
Shared definition	No	Yes
Conceptual model	Resources	Graphs
Organization	Federated	Centralized
Related operations	Yes	No
Introspection	No	Yes
Data typing	Weak	Strong
Real time	No	Yes

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

GraphQL superpowers

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Efficiency

- Overfetching: response contained too much data
- Underfetching: response did not contain enough data – make another network request
- Networks latencies
  - Read 1 MB from SSD: 400 µs
  - Packet US ↔ EU: 150 ms

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Efficiency

- Avoid overfetching and underfetching
- Clients declare all the data they need in a single network request
- Reduces client-side joins, error handling, and retry logic

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Type safety

- Predictability
- Native clients
- Code gen

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Domain modeling

Domain-Driven Design

Eric Evans, 2004

Shared language

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Authentication and authorization

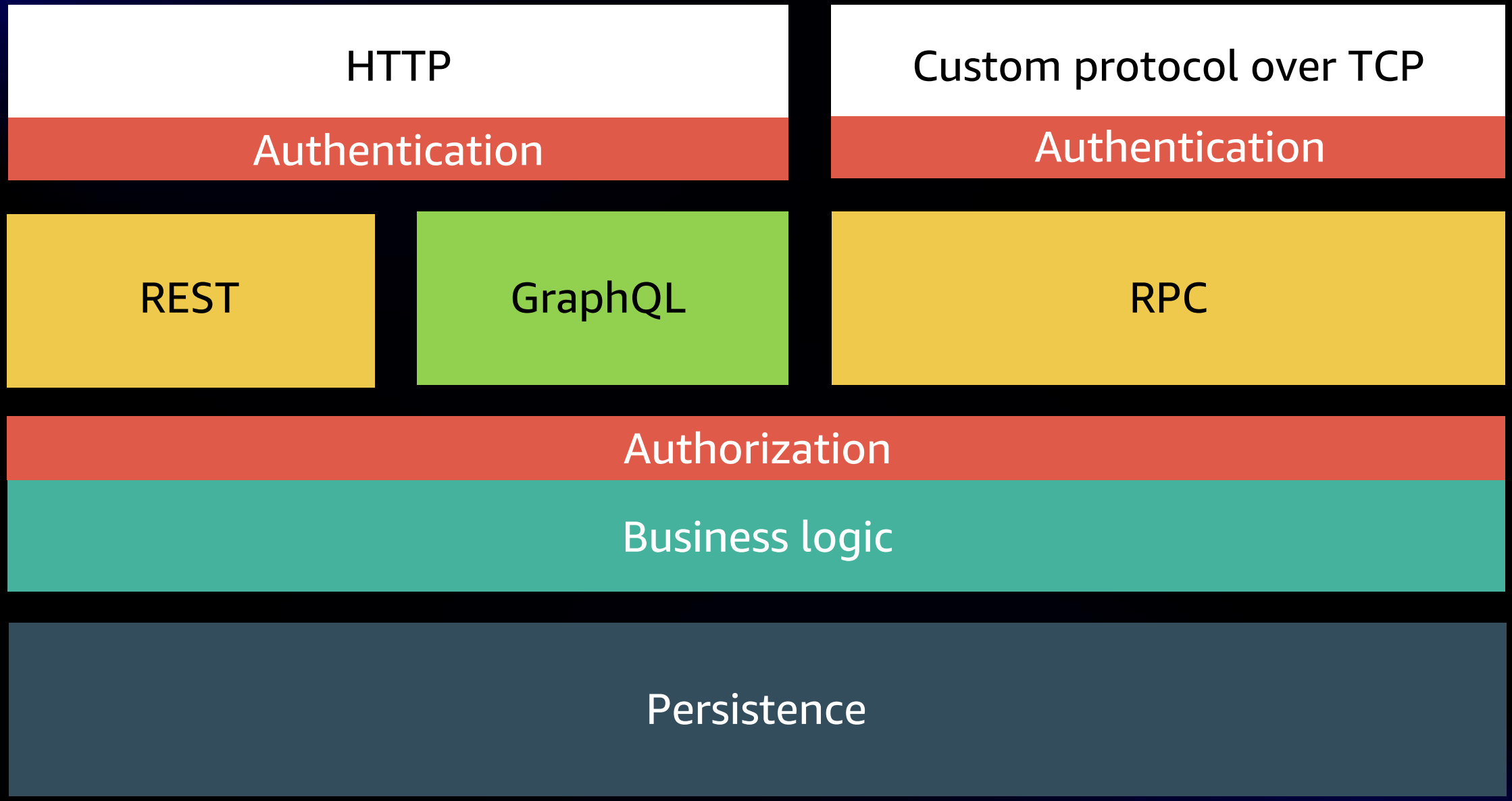
Authentication

Who are you?

Authorization

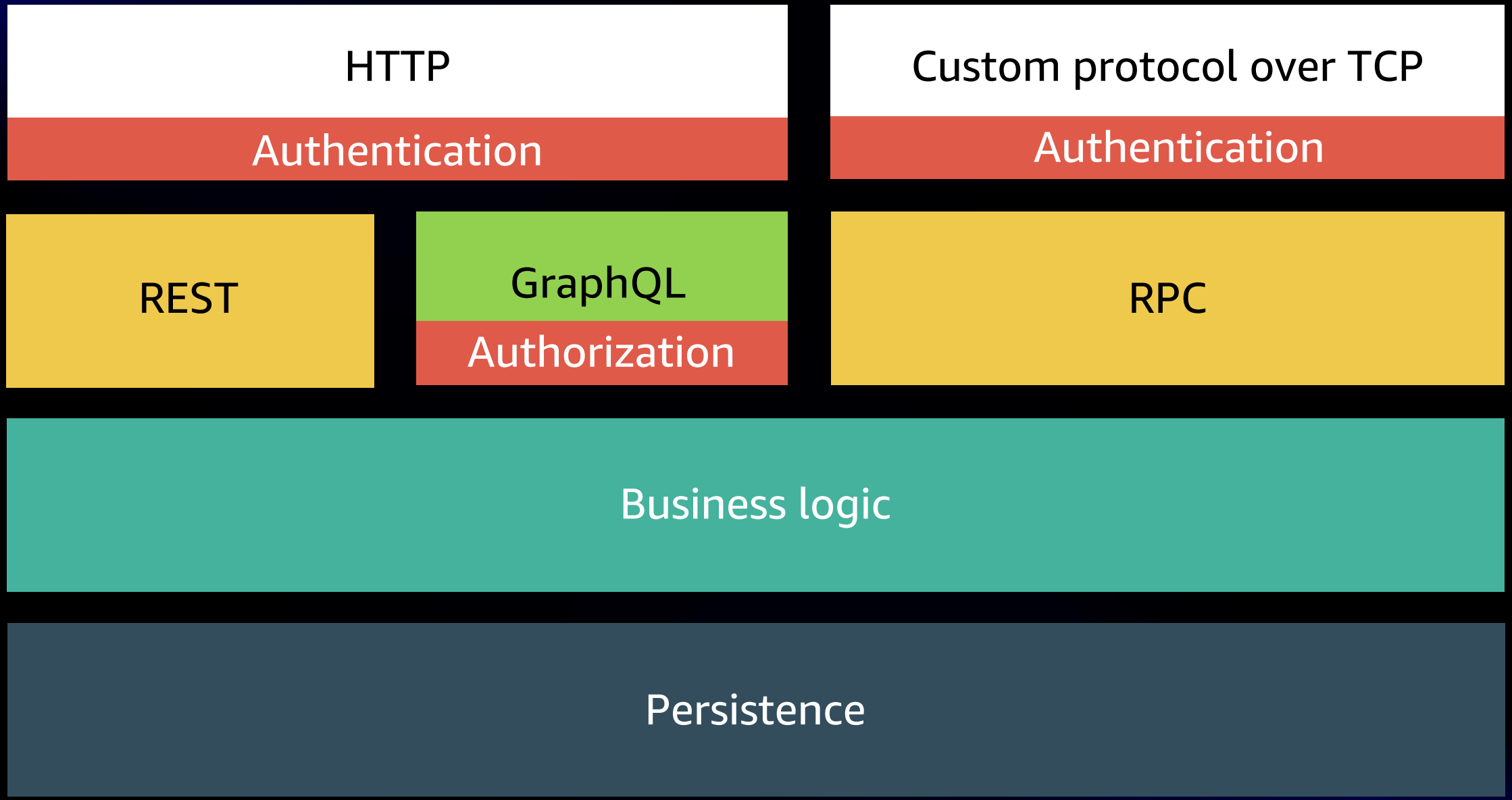
Do you have permission?

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.



aws

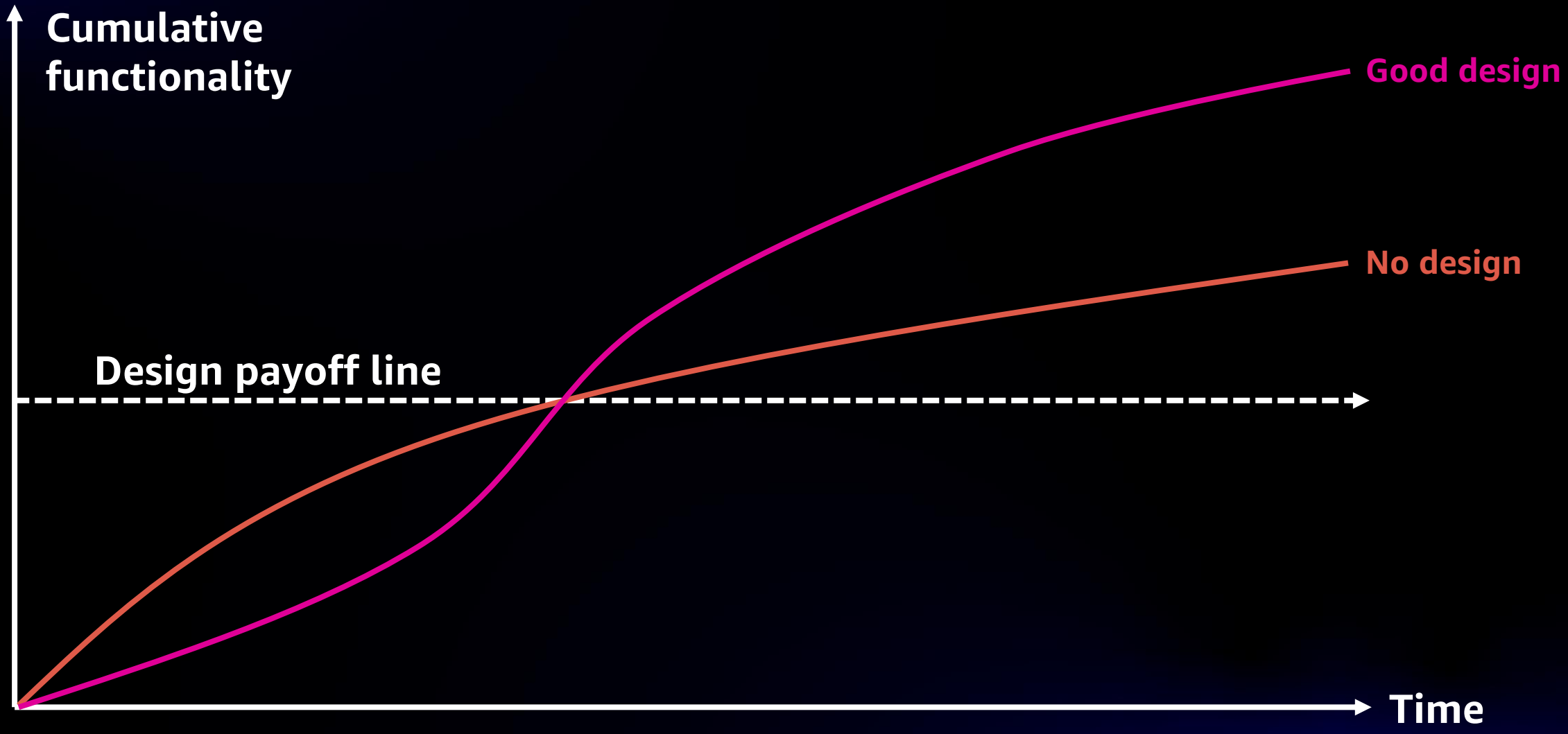
© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.



aws

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

When to use GraphQL



© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Getting GraphQL into production

DO NOT

- Build a complete schema upfront
- Try to replace your REST API in one push
- Place business logic in the GraphQL layer

DO

- Educate your team
- Choose a solution that fits with your stack
- Build a simple query first (read-only)
- Gradually layer in features like auth/mutations
- Gradually expand schema

aws

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Advanced use cases

- Amazon API Gateway
- 1st party vs. 3rd party
- Service-to-service
- Domain modeling: schema-first
- Persisted queries
- Subscriptions
- Live queries

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Resources

Start here: graphql.org

Community: graphql.org/community

Demo: github.com/robzhu/tsgraphql-starwars

AWS AppSync: aws.amazon.com/appsync

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.

Thank you!

Robert Zhu

robzhu@amazon.com

© 2021, Amazon Web Services, Inc. or its affiliates. All rights reserved.