

Serverless Architecture

Software Architecture

Richard Thomas

May 12, 2025

Oxymoron 1. Serverless

Logic running on someone else's server.

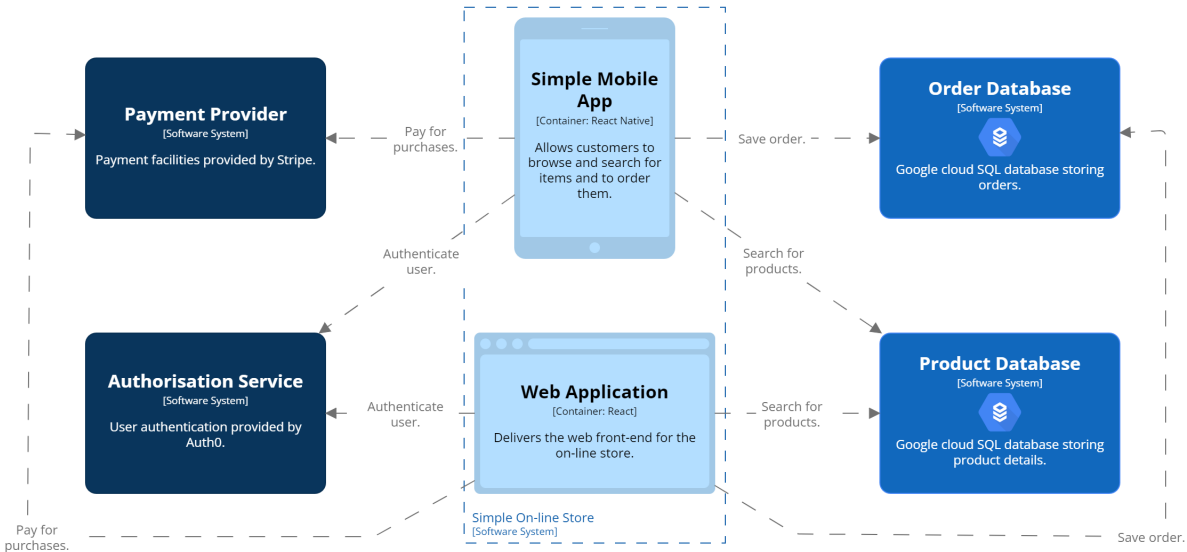
Definition 0. Backend as a Service (BaaS)

Cloud-hosted applications or services that deliver functionality used by an application front-end.

BaaS Iceberg *[Brunko, 2019]*



BaaS Example



Definition 0. Functions as a Service (FaaS)

Application logic that is triggered by an event and runs in a *transient*, *stateless* compute node.

FaaS Iceberg *[Brunko, 2019]*



FaaS Example



Definition 0. Serverless Architecture

Software system delivering functionality through BaaS or FaaS.

Sahara Browse & Order — Serverless



Sahara Fulfilment — Serverless



Serverless Benefits

- Automatic scaling
 - Multiple instances of function

Serverless Benefits

- Automatic scaling
 - Multiple instances of function
- Reduced cost for dynamic loads
 - No server idle time

Serverless Benefits

- Automatic scaling
 - Multiple instances of function
- Reduced cost for dynamic loads
 - No server idle time
- Reduced server management

Serverless Benefits

- Automatic scaling
 - Multiple instances of function
- Reduced cost for dynamic loads
 - No server idle time
- Reduced server management
- Easier to run closer to client
 - Launch in same zone as client

BaaS Tradeoffs

- Front-end accesses database directly
 - Front-end needs to sanitise inputs
 - Easy to spoof messages from front-end
 - Hope DB provider is secure

BaaS Tradeoffs

- Front-end accesses database directly
 - Front-end needs to sanitise inputs
 - Easy to spoof messages from front-end
 - Hope DB provider is secure
- Application logic is in front-end
 - Less modularisation
 - Duplication of logic with multiple front-ends
 - Web, mobile, ...

BaaS Tradeoffs

- Front-end accesses database directly
 - Front-end needs to sanitise inputs
 - Easy to spoof messages from front-end
 - Hope DB provider is secure
- Application logic is in front-end
 - Less modularisation
 - Duplication of logic with multiple front-ends
 - Web, mobile, ...
- No control over server optimisation

FaaS Tradeoffs

- No server state
 - All state needs to be saved (e.g. Redis, S3, ...)
 - Not just persistent state

FaaS Tradeoffs

- No server state
 - All state needs to be saved (e.g. Redis, S3, ...)
 - Not just persistent state
- Execution duration
 - Can't be long running process
 - AWS Lambda – up to 15 minutes

FaaS Tradeoffs

- No server state
 - All state needs to be saved (e.g. Redis, S3, ...)
 - Not just persistent state
- Execution duration
 - Can't be long running process
 - AWS Lambda – up to 15 minutes
- Startup latency
 - Functions take time to start
 - Some languages worse than others (e.g. Java)

FaaS Tradeoffs

- No server state
 - All state needs to be saved (e.g. Redis, S3, ...)
 - Not just persistent state
- Execution duration
 - Can't be long running process
 - AWS Lambda – up to 15 minutes
- Startup latency
 - Functions take time to start
 - Some languages worse than others (e.g. Java)
- Proliferation of functions
 - Loss of encapsulation

Question

When is serverless appropriate?

Question

When is serverless appropriate?

Answer

- Rich client apps with common backend
 - BaaS

Question

When is serverless appropriate?

Answer

- Rich client apps with common backend
 - BaaS
- High latency processing
 - Within function duration constraints

Question

When is serverless appropriate?

Answer

- Rich client apps with common backend
 - BaaS
- High latency processing
 - Within function duration constraints
- Apps with variable load
 - Take advantage of auto-scaling

Question

When is serverless *not* appropriate?

Question

When is serverless *not* appropriate?

Answer

- Quick response required
 - Can't wait for FaaS to start

Question

When is serverless *not* appropriate?

Answer

- Quick response required
 - Can't wait for FaaS to start
- Compute intensive processing

Question

When is serverless *not* appropriate?

Answer

- Quick response required
 - Can't wait for FaaS to start
- Compute intensive processing
- Apps with steady load
 - Server-based approaches are cheaper

Self-Study Exercise

- Redesign your scalability assignment to be serverless.
 - What parts of your design would benefit from being serverless?
- Implement your revised design.

Pros & Cons

Extensibility



Reliability



Interoperability



Scalability



Deployability



Modularity



Testability



Maintainability



Security



Simplicity



References

[Brunko, 2019] Brunko, P. (2019).

Serverless architecture: When to use this approach and what benefits it gives.

<https://apiko.com/blog/serverless-architecture-benefits/>.