

# Service-Based Architecture

## *Software Architecture*

Richard Thomas

March 11, 2024

### *Definition 1.* Distributed System

A system with multiple components located on different machines that communicate and coordinate actions in order to appear as a single coherent system to the end-user.

*Quote*

A distributed system is one in which the failure of a computer you didn't even know existed can render your own computer unusable.

– Leslie Lamport [Turing Award, 2013]

### *Definition 2.* Service-Based Architecture

System is partitioned into business domains that are deployed as distributed services. Functionality is delivered through a user interface that interacts with the domain services.

# Service-Based Architecture



## Terminology

**User Interface** Provides access to system functionality

**Services** Implement functionality for a single,  
independent business process

**Service APIs** Communication mechanism between UI  
and each service

**Database** Stores persistent data for the system

*Definition 3.* API Abstraction Principle

Services should provide an API that hides implementation details.

### *Definition 4.* Façade Design Pattern

Provide a simple, abstract interface to use a service domain's functionality. A component within the service coordinates how to deliver the requested functionality with the service's internal components.



*Definition 5.* Independent Service Principle

Services should be independent, with no dependencies on other services.

*Question*

What are the consequences of having a shared database?

*Question*

What are the consequences of having a shared database?

*Answer*

Increased *data coupling*.

# Logical Partitioning of Persistent Data



# Separate Databases



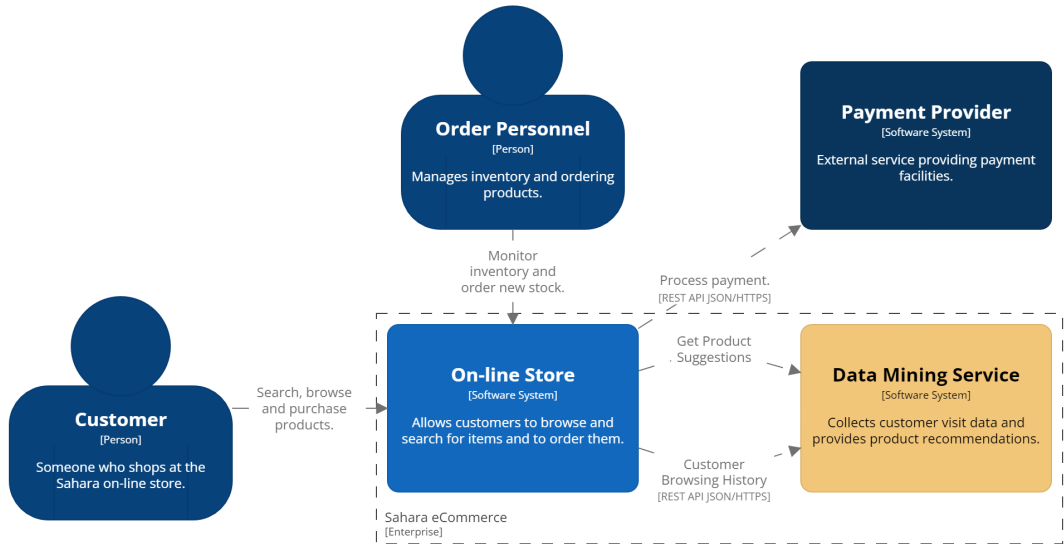
# Separate UIs



# Separate UIs



# Sahara: Context Diagram





## On-line Store Service Domains

**Browsing** Customers can find products & add to cart

**Purchasing** Customers can purchase products in cart

**Fulfilment** Customers & staff can track order fulfilment

**Account Management** Customers can manage their  
account details

**Inventory Management** Staff can view stock levels and  
order new stock

### *Partitioning*

Services are defined by domain partitioning

## Coarse Services

- Domains are large
  - *Coarse-grained* services
- Each service will have an internal architecture
  - Technical or domain partitioning

# Sahara: On-line Store Container Diagram



# Sahara: Product Browsing Component Diagram



## Product Browsing Service API

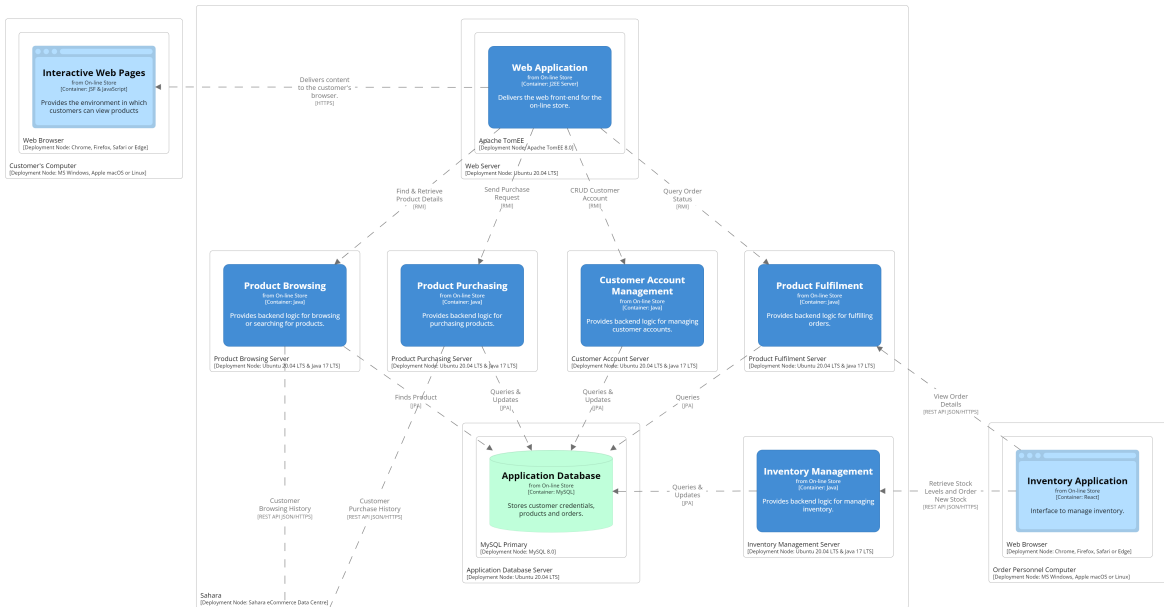
**Search** <https://api.sahara.com/v1/search?keywords=...>

**Browse** <https://api.sahara.com/v1/browse?category=...>

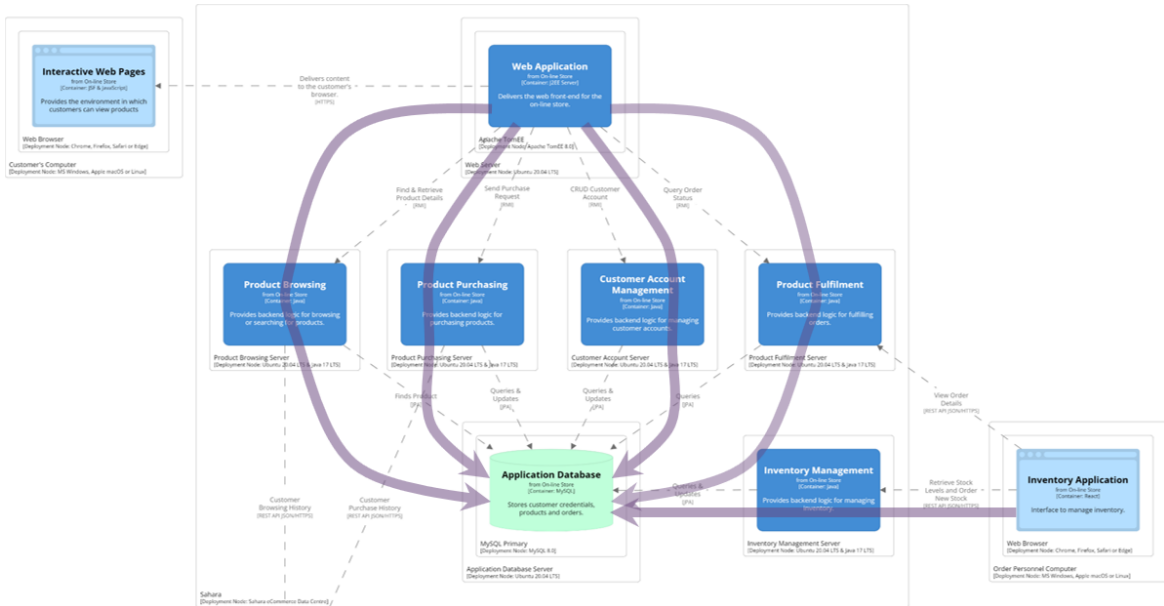
**Add to Cart** <https://api.sahara.com/v1/cart>

- JSON to pass data
- JSF action controller handles request

# Sahara: Deployment Diagram



# Sahara: Concurrent Access





*Question*

What happens if a service goes down?

*Question*

What happens if a service goes down?

*Answer*

Need to manage timeouts, retries, graceful failure, ...

## Consider Network Failure

If customer tried to add product to cart:

- What happens if Product Browsing didn't receive it?
- What happens if UI didn't get a response?
- What happens if Database wasn't updated?

# API Layer



## API Layer Advantages

- Acts as a reverse proxy or gateway to services
- Hides internal network structure
- Easier to implement *cross-cutting* concerns
  - e.g. security policies
- Allows service discovery
  - Interface to register service
  - Clients can find out what services are available

## Pros & Cons

Simplicity *For a distributed system*



Modularity Services



Extensibility New services



Deployability Independent services



Testability Independent services



Security API layer



Reliability Independent services



Interoperability Service APIs



Scalability Coarse-grained services

