Service-Based Architecture

Software Architecture

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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

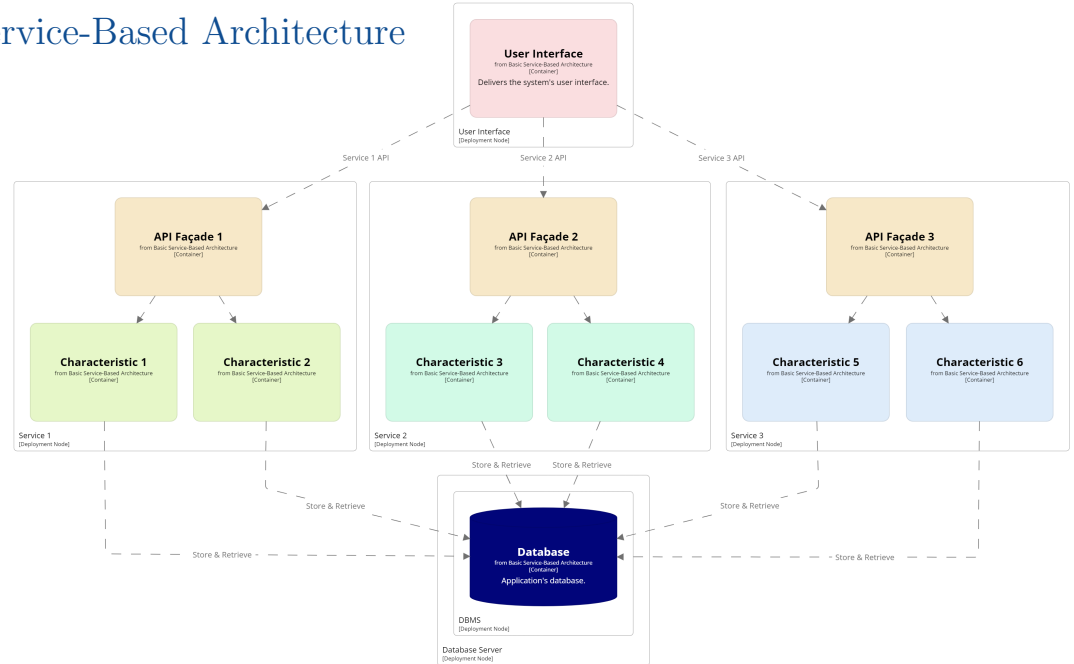
A distributed system is one in which the failure of a computer you didn't even know existed can render your own computer unusable.

– 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

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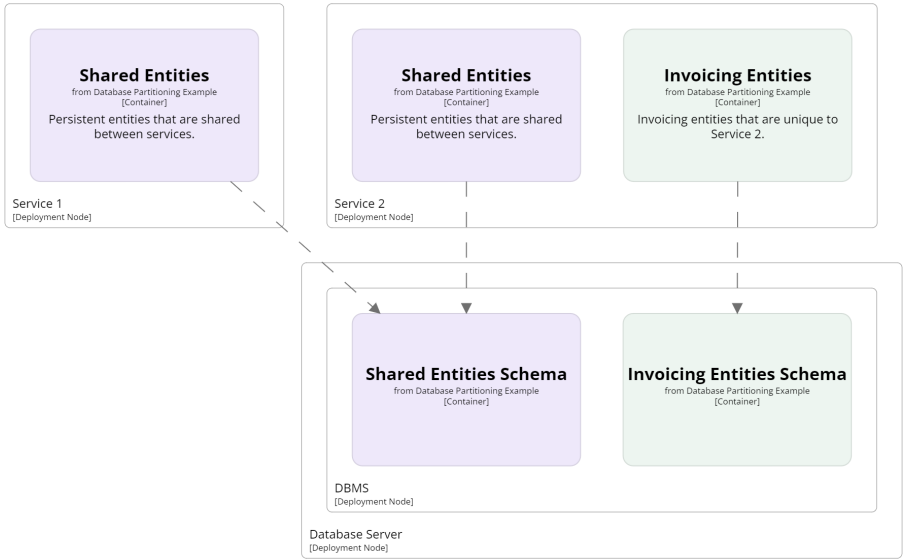
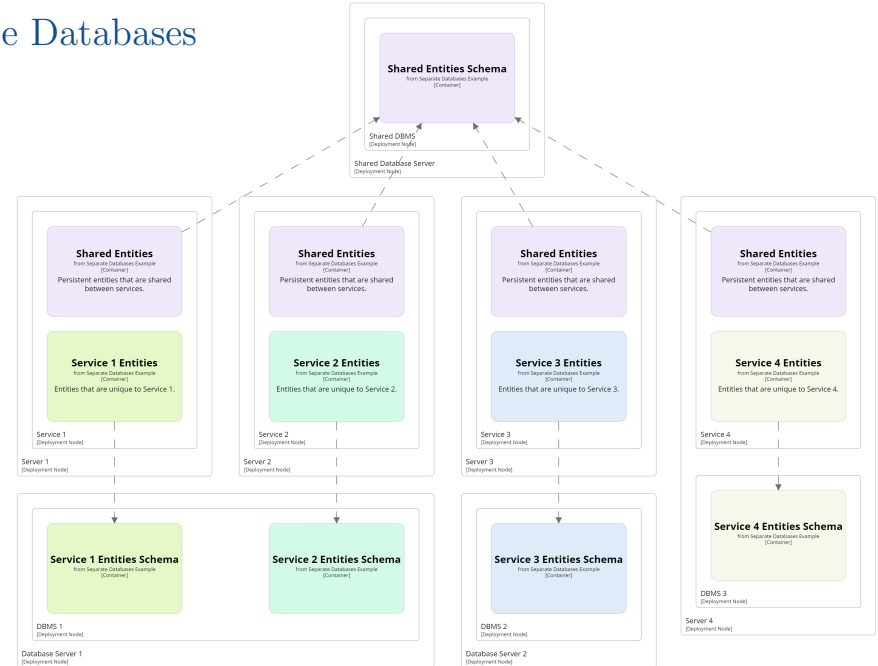
Answer

Increased *data coupling*.

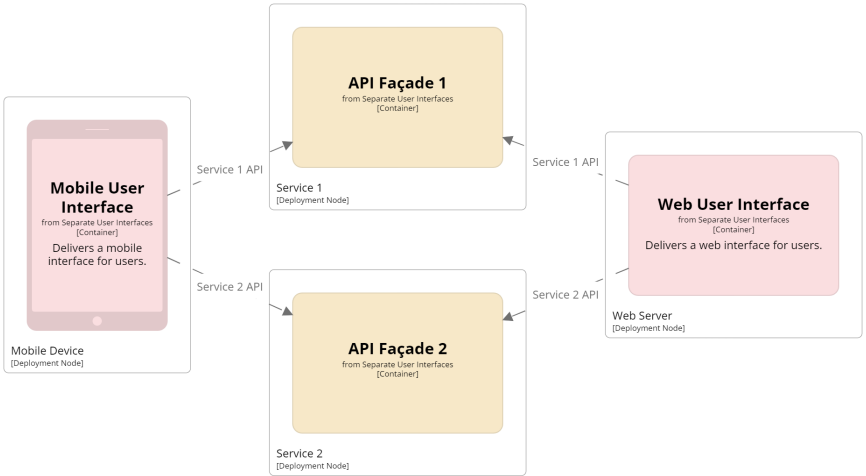
Logical Partitioning of Persistent Data



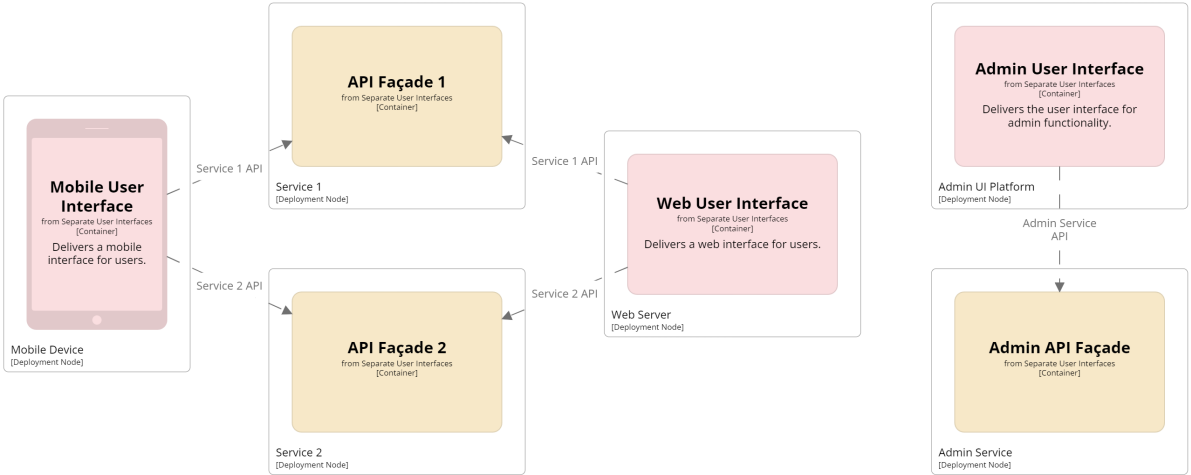
Separate Databases



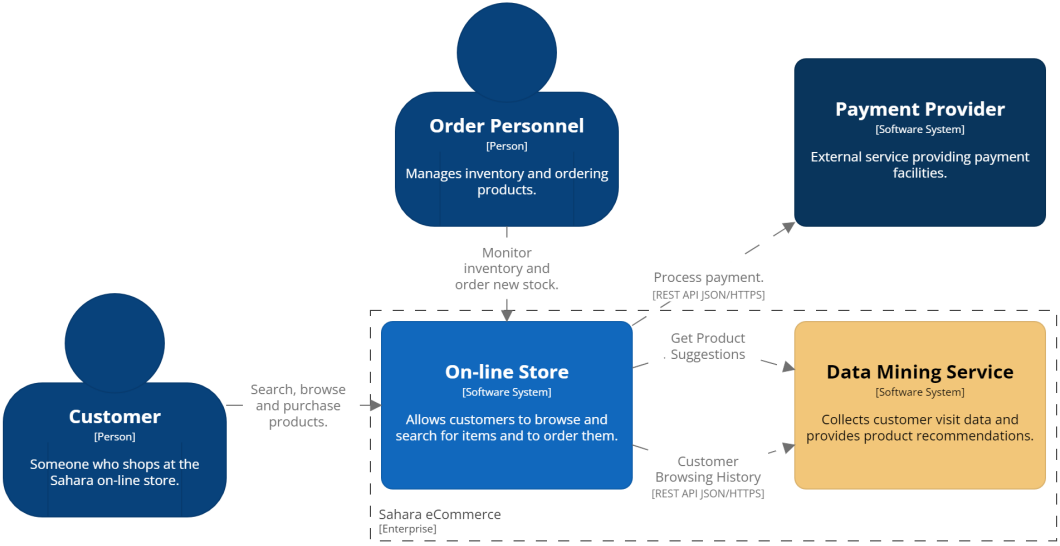
Separate UIs



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

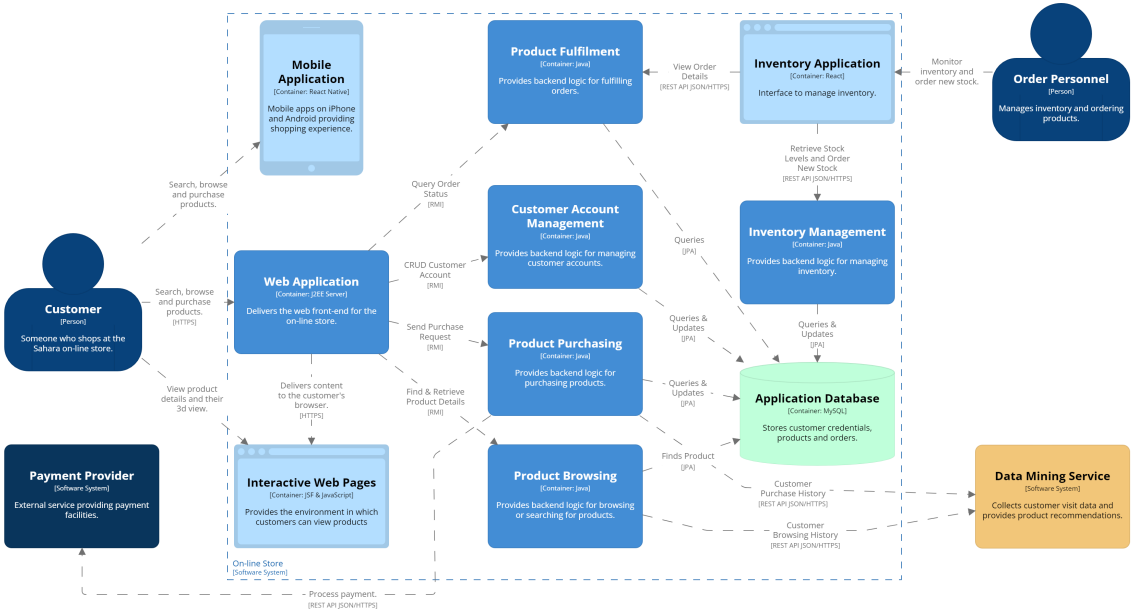
Partitioning

Services are defined by domain partitioning

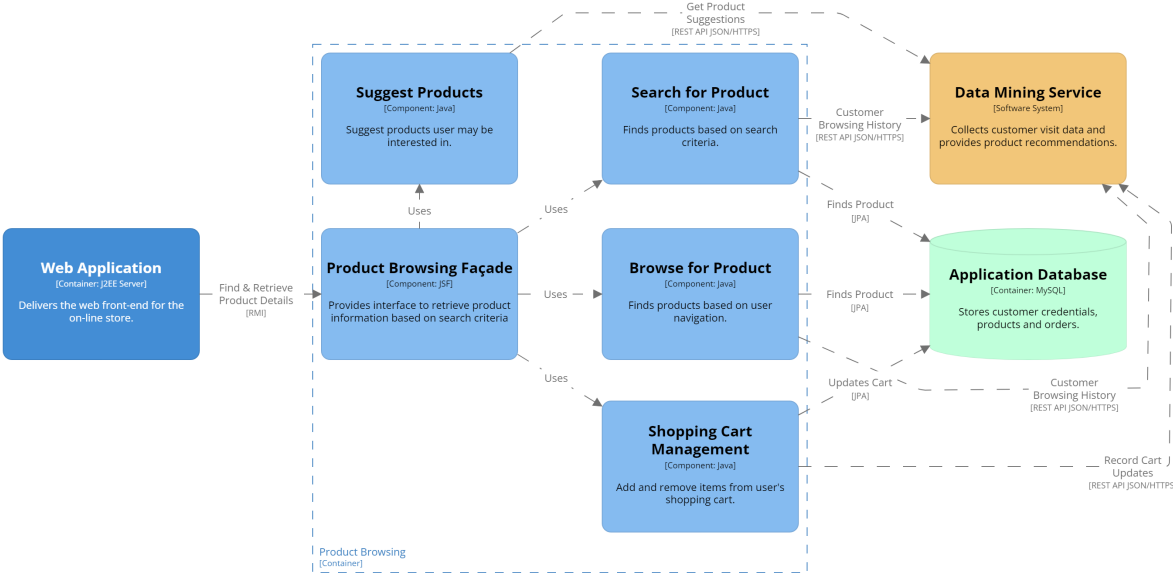
Coarse Services

- 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

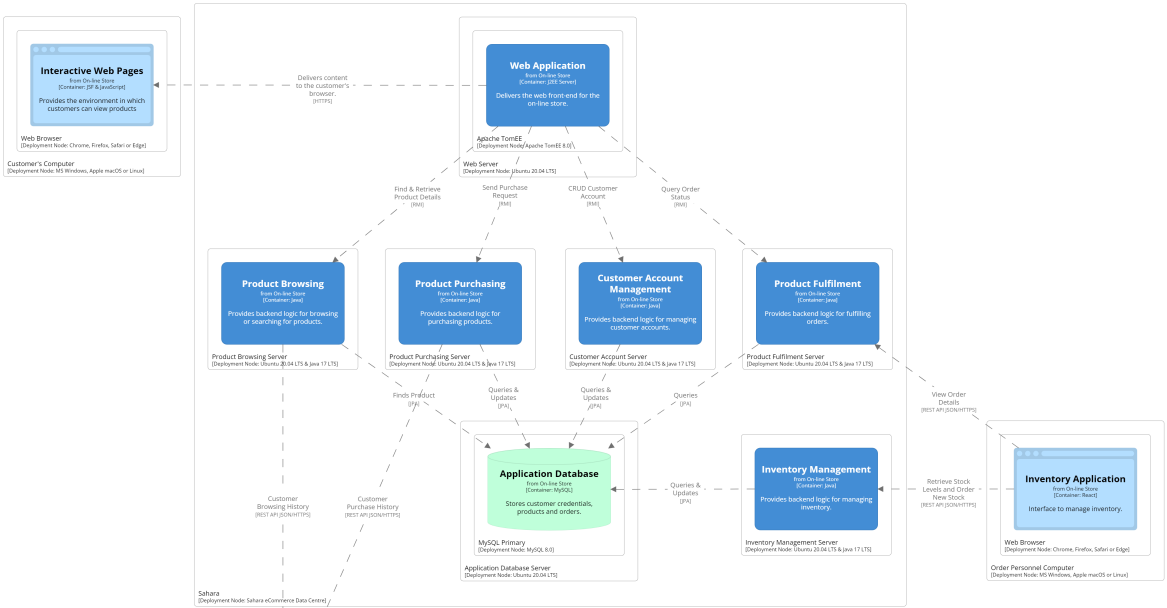
Search https://api.sahara.com/v1/search?keywords=...

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

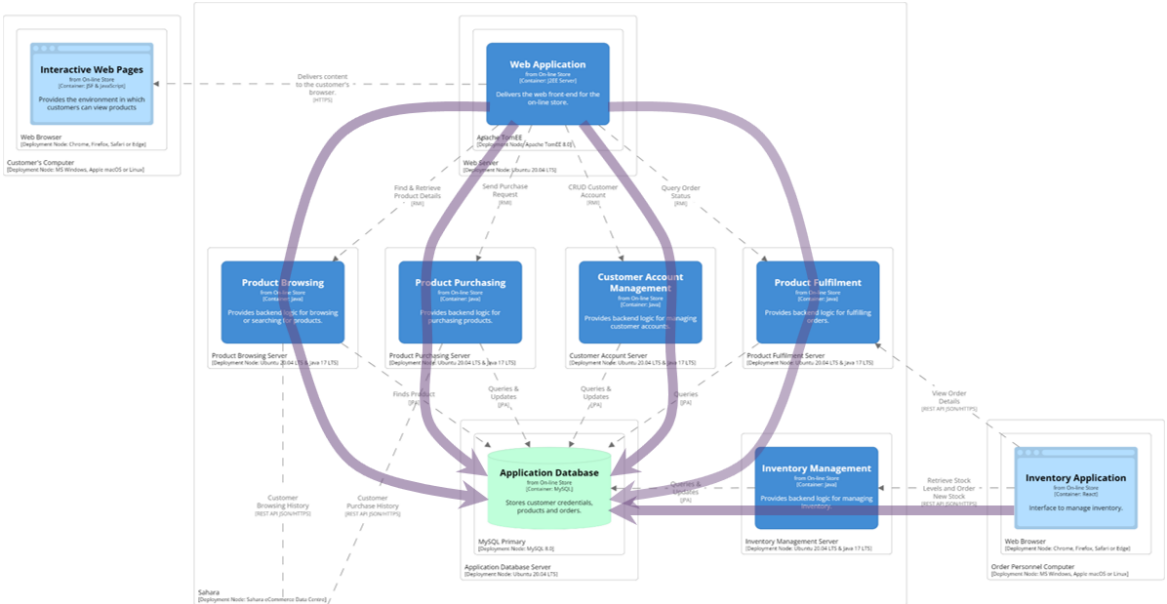
Add to Cart https://api.sahara.com/v1/cart

- JSON to pass data
- JSF action controller handles request

Sahara: Deployment Diagram



Sahara: Concurrent Access



Question

What happens if a service goes down?

Question

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Answer

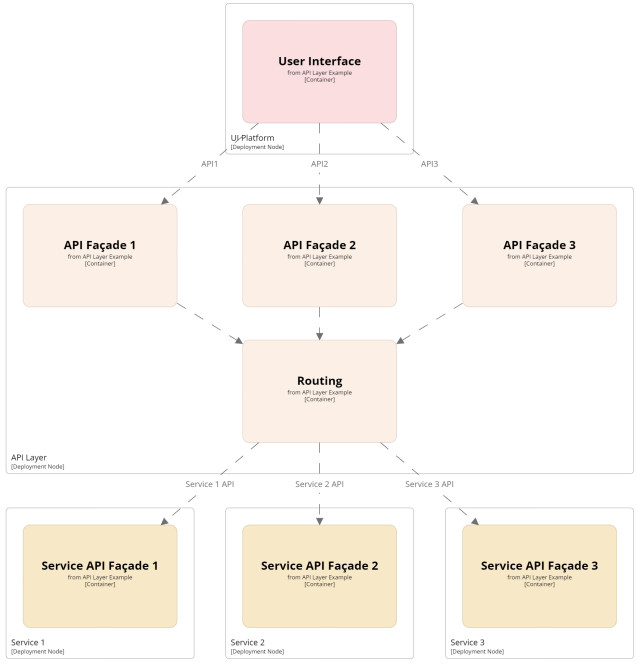
Need to manage timeouts, retries, graceful failure, ...

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


User Interface
from API Layer Example
[Container]
UI-Platform
[Deployment Node]
API1
API2
API3
API Façade 1
from API Layer Example
[Container]
API Façade 2
from API Layer Example
[Container]
API Façade 3
from API Layer Example
[Container]
Routing
from API Layer Example
[Container]
API Layer
[Deployment Node]
Service 1 API
Service 2 API
Service 3 API
Service API Façade 1
from API Layer Example
[Container]
Service API Façade 2
from API Layer Example
[Container]
Service API Façade 3
from API Layer Example
[Container]
Service 1
[Deployment Node]
Service 2
[Deployment Node]
Service 3
[Deployment Node]

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