

# Decomposing Monoliths

*CSSE6400*

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- Simple deployment
- Simple communication between modules
- Simple system testing & debugging

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- Many legacy system nightmares were monoliths
- Easy to defeat modularity
- Cannot scale components of system
- Monolith databases scale poorly

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- Greenfields replacement

### Replacement

- Can choose any suitable architecture.
- Risky, as you're developing a new system and maintaining existing.

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What can be done if a monolith architecture is no longer suitable?

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- Greenfields replacement
- Migrate to another architecture

### Migration

- Adaptive maintenance, changing architecture slowly.
- Some limitation on choice of architecture, but most sophisticated architecture can be used.

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How do I migrate a monolith to a new architecture?

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*Answer*

Decompose the monolith into services.

Implies a service-based or microservices architecture.

## Strangler Fig Pattern

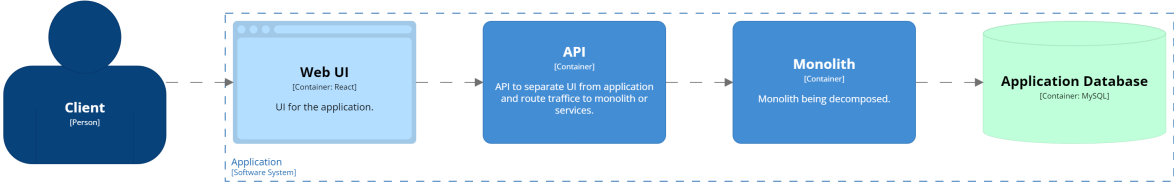
- Develop API for application's UI
- Proxy intercepts API calls
  - Proxy directs calls to application or new services
- Implement a service
  - Redirect calls to service
- Progressively replace monolith
- Shadow & Blue-Green Deployment



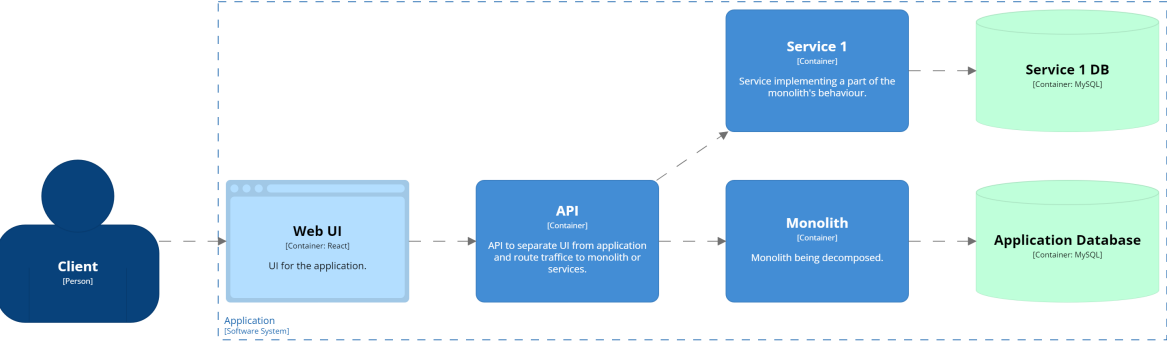
- May already have an API if the UI is a web or mobile app.
- Initially deploy proxy and new interface into production, with only existing monolith. Test it works as expected.
- Use shadow deployment to test service with application, before making available to end users.



# Monolith Deployment



# Monolith Decompose: Step 1



# Monolith Decompose: Step 2



## Decomposition Process

- Identify bounded-contexts
  - Simple first service
    - e.g. Authentication
  - Minimise dependency from services to monolith
    - Monolith may use services
- Use first service (or first few) to validate approach and deployment infrastructure.
  - Minimise changes required in monolith.

## Decomposition Process

- Reduce coupling between bounded- contexts
    - e.g. Customer account management
      - Profile, Wish List, Payment Preferences – separate services
  - Decouple vertically
    - Service delivers entire bounded-context
      - Data is decoupled from monolith
- Account management may be tightly coupled in monolith. Separate each aspect (context), one at a time.
  - Do not focus only on UI or internal components, service needs to implement all parts of the business process.
  - Data management needs to be decentralised.

## Decomposition Process

- Focus on pain points
  - Bottlenecks
  - Frequently changing behaviour
- Rewrite, don't reuse
  - Redesign for new infrastructure
  - Reuse complex logic
    - e.g. Discounts based on customer loyalty and behaviour, bundle offers, ...
- Extract services that deliver highest value.
- What contexts may need to scale more than others?
- What contexts change more frequently and benefit from separate deployment?
- Services deliver capabilities provided by monolith.
- Most often it is better to rewrite the capability to take advantage of new infrastructure.
- Only reuse code that has complex logic that will be difficult to duplicate and test fully.

## Atomic Decomposition

- Refactor monolith
  - Use service to deliver application functionality
    - Monolith may need to invoke service
  - Remove service logic from monolith
- Atomic replacement of monolith behaviour by service's behaviour.
- Don't deploy production code with service behaviour left in monolith. Leads to a maintenance nightmare determining where behaviour is used, or it may be used in both the monolith and service.

### *Stepwise Decomposition*

Replace application functionality one service at a time.



### *Definition 1. Macroservice*

Separate service, but may span more than one domain or share a database with the monolith or other services.

- Similar scalability and deployment issues to a monolith, but grouped by clusters of macroservices if they share a database.
- Interim step to build microservices.

*Definition 2.* Nanoservice

Service that depends on other services and cannot be deployed independently – its context is too small.

- Anti-pattern where services are too fine grained and need to be coupled to deliver business processes.
- Some use the term “nanoservice” to refer to independently deployable functions, similar to serverless architecture.