

# Decomposing Monoliths

*CSSE6400*

Richard Thomas

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### *Answer*

- 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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### *Answer*

- Greenfield replacement

### Replacement

- Pro: Can choose any suitable architecture.
- Risk: Developing a new system and maintaining existing.

### *Question*

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

### *Answer*

- Greenfield replacement
- Migrate to another architecture

### Migration

- Adaptive maintenance, changing architecture slowly.
- Some limitation on choice of architecture, but most sophisticated architectures 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 micro-services architecture.

Strangler Fig Pattern *[Fowler, 2024]*





## Strangler Fig Pattern *[Fowler, 2024]*

- Develop API for application's UI



May already have an API if the UI is a web or mobile app.

## Strangler Fig Pattern *[Fowler, 2024]*

- Develop API for application's UI
- Proxy intercepts API calls
  - Proxy directs calls to application or new services



Initially deploy proxy and new interface into production, with only existing monolith. Test it works as expected.

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- Implement a service
  - Redirect calls to service



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- Progressively replace monolith



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- Implement a service
  - Redirect calls to service
- Progressively replace monolith
- Shadow & Blue-Green Deployment



- Shadow deployment to test service with application.
- Blue-Green deployment to switch over to using service.

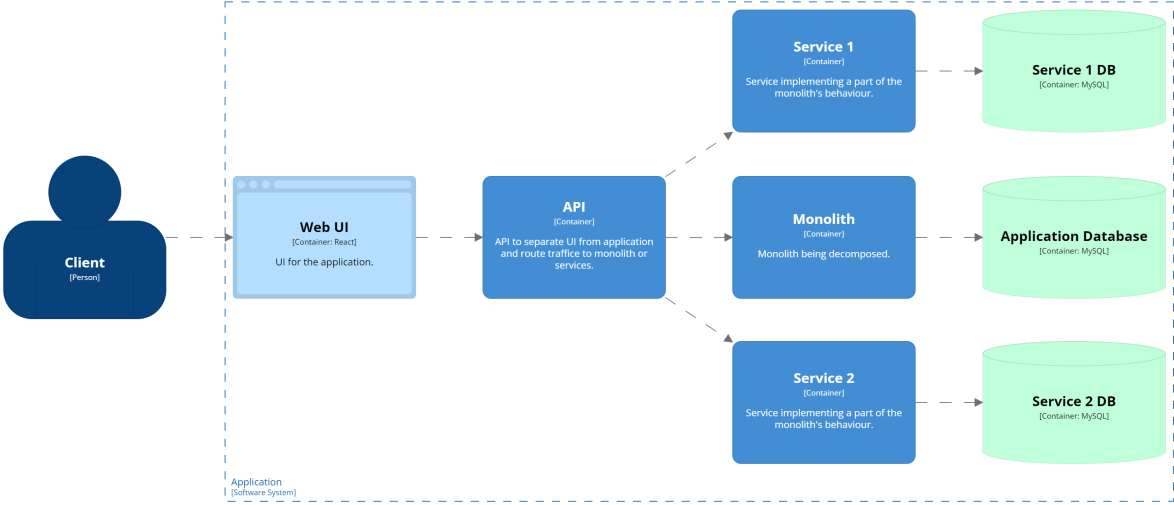
# Monolith Deployment



# Monolith Decompose: Step 1



# Monolith Decompose: Step 2



May leave some stable functionality in monolith, if there is little benefit of creating services for that functionality.



# Decomposition Process

- Identify bounded-contexts

## Decomposition Process

- Identify bounded-contexts
- Simple first service
  - e.g. Authentication

Use first service (or first few) to validate approach and deployment infrastructure.

## Decomposition Process

- Identify bounded-contexts
- Simple first service
  - e.g. Authentication
- Minimise dependency from services to monolith
  - Monolith may use services
- Monolith decomposition will continue.
  - Don't want to have to refactor service once functionality is removed from monolith.
  - Don't want services to end up depending on each other.
- Minimise changes required in monolith.
  - But expect a fair bit of work removing features from monolith.

## Decomposition Process

- Reduce coupling between bounded-contexts
  - e.g. Customer account management
    - Profile, Wish List, Payment Preferences
      - Separate Services

Account management may be tightly coupled in monolith.  
Separate each aspect (context), one at a time.

## 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



- Do not focus only on UI or internal components.
  - Service needs to implement *all* parts of the business process.
    - Slice of cake analogy, you want a vertical slice containing all layers, not just the icing on top.
- Data management needs to be decentralised.

## Decomposition Process

- Focus on pain points
  - Bottlenecks
  - Frequently changing behaviour
- 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?

## 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, ...
- Services deliver capabilities provided by monolith.
  - Usually 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.
    - May be used in both the monolith and service.



### *Stepwise Decomposition*

Replace application functionality one service at a time.

### *Definition 0. 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 0. 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.

## References

[Fowler, 2024] Fowler, M. (2024).

Strangler fig.

<https://martinfowler.com/bliki/StranglerFigApplication.html>.