

# Architectural Skills

CSSE6400

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May 30, 2022

Quote

Architecture is the stuff you can't Google.

– Mark Richards [1]

Quote

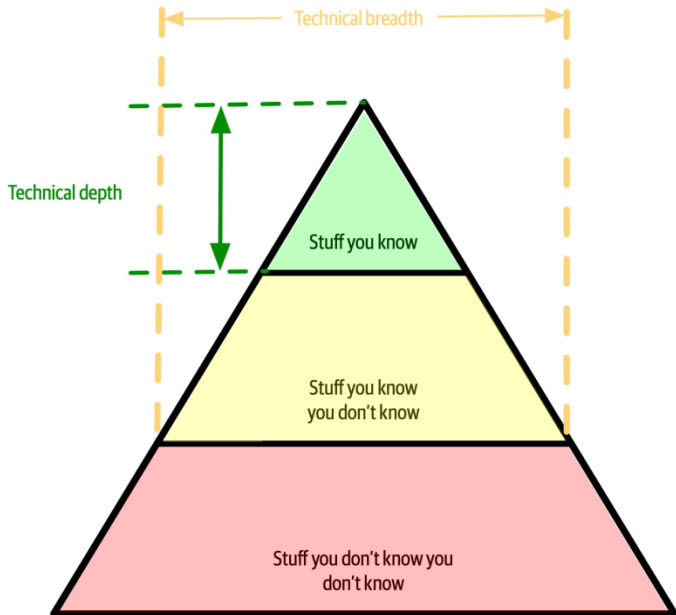
There are no right or wrong answers in architecture—only trade-offs.

— Neal Ford [\[1\]](#)

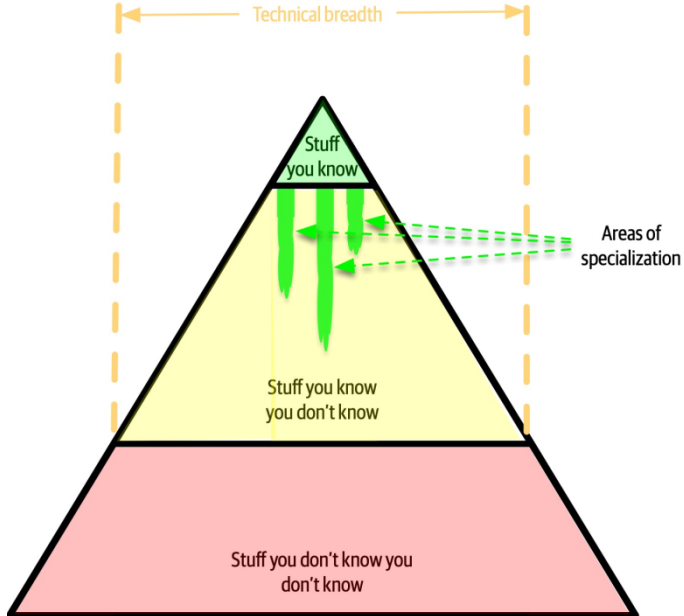
## Architectural Design

Architects use knowledge and experience to analyse trade-offs to design architectures appropriate to the system context.

## Developers – Technical Depth [1]



# Architects – Technical Breadth [1]



Question

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- Simple deployment



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- Simple communication between modules

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



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### Answer

- Greenfields replacement

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### Answer

- Greenfields replacement
- Migrate to another architecture

Question

How do I migrate a monolith to a new architecture?

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### Answer

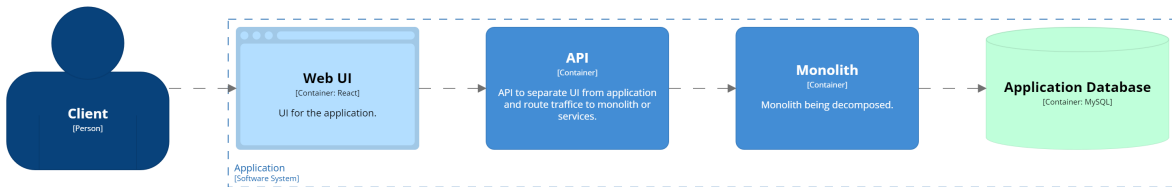
Decompose the monolith into services.

# Strangler Fig Pattern

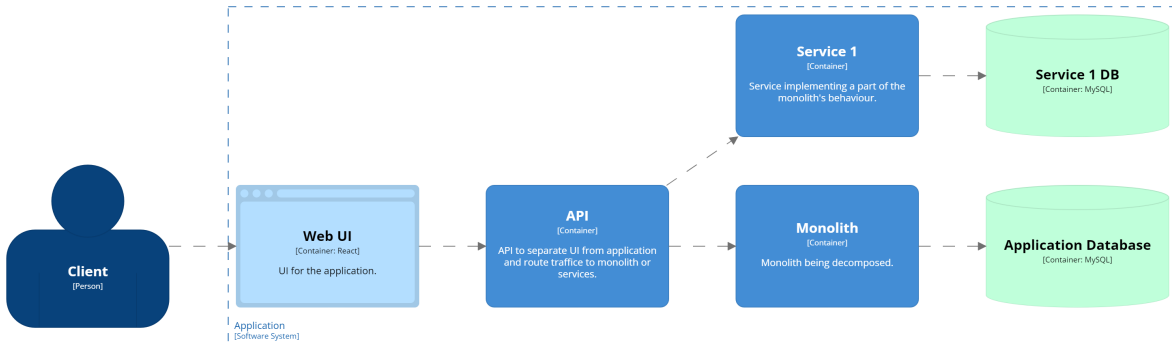
- Develop API for application's UI
- Proxy intercepts API calls
  - Proxy directs calls to application or new services
- Implement a service
  - Redirect calls to service
- Progressively replace monolith
- Shadow & Blue-Green Deployment



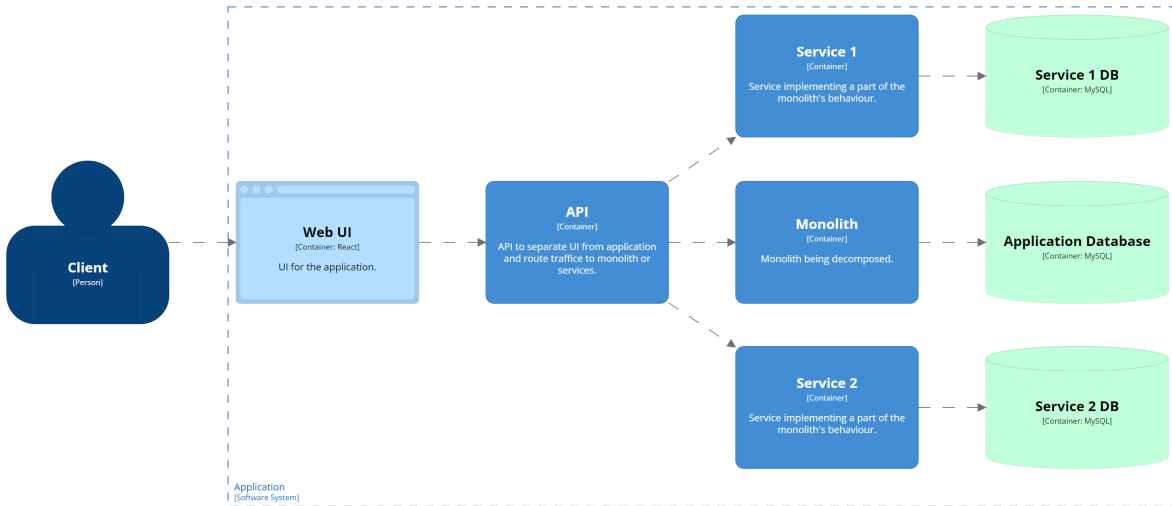
# Monolith Deployment



# 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

## 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

## 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, ...

## Atomic Decomposition

- Refactor monolith
  - Use service to deliver application functionality
    - Monolith may need to invoke service
  - Remove service logic from monolith

## 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.

## Definition 2. Conway's Law

Organisations design systems whose structure is inevitably a copy of the organisation's communication structure [2] [3].

## Conway's Law Consequences

- Business Process Management
- Microservices to reflect organisation structure
- Teams formed around services



Conway's Law Consequences

Team insularity – more loyal to team than organisation.

## Conway's Law Issues

- Cross-cutting concerns
  - e.g. Security
- Organisation structure should align with market structure
- Physical location of teams

Evidenced-Based Software Engineering

Don't follow fads, seek evidence for good practice.

Let's hear from an expert

## Software Engineering's Greatest Hits

**what we actually know about software development  
and why we believe it's true**



**Greg Wilson**

<http://third-bit.com/talks/greatest-hits/>



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## References

- [1] Mark Richards and Neal Ford.  
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O'Reilly Media, Inc., January 2020.
- [2] Melvin E. Conway.  
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*Datamation*, April 1968.
- [3] Alan MacCormack, Carliss Baldwin, and John Rusnak.  
*Exploring the duality between product and organizational architectures: A test of the “mirroring” hypothesis.*  
*Research Policy*, 41(8):1309–1324, 2012.