

Establishing a Foundation for Microservices

Mike Amundsen
API Academy/CA Technologies
@mamund





Mike Amundsen
@mamund



API Design and Strategy | x

www.apiacademy.co


MENU

API ACADEMY

SERVICES

EVENTS

EBOOK



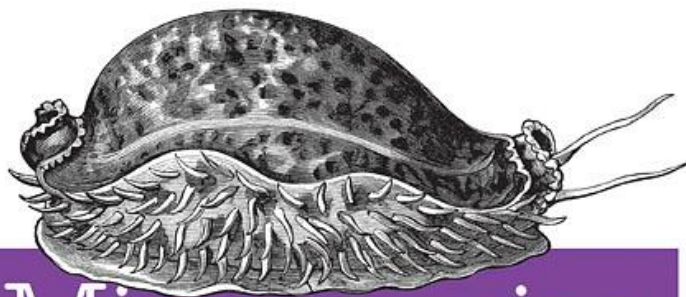
API STRATEGY & ARCHITECTURE: A COORDINATED APPROACH

DISCOVER HOW TO ALIGN API ARCHITECTURE WITH YOUR ORGANIZATION'S BUSINESS GOALS

READ MORE

Help People Build Great APIs

O'REILLY®



Microservice Architecture

ALIGNING PRINCIPLES, PRACTICES, AND CULTURE

Irakli Nadareishvili, Ronnie Mitra,
Matt McLarty & Mike Amundsen

<http://g.mamund.com/msabook>

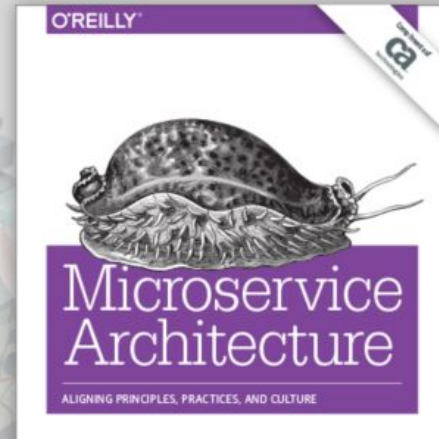


Microservice Architecture: Aligning Principles, Practices, and Culture

Microservices is the next evolution in software architecture designed to help organizations embrace continual change in the digital economy. But how do you design and apply an effective microservice architecture?

This new book from O'Reilly provides comprehensive guidance through seven valuable chapters that give you a deep-dive into:

- The benefits and principles of microservices
- A design-based approach to microservice architecture
- Lessons for applying microservices in practice



Establishing Foundations

- The Microservice Way
- Goals
- Principles
- Capabilities
- Culture

way

/wā/ 

noun

1. a method, style, or manner of doing something.

"worry was their way of showing how much they cared"

synonyms: [method](#), [process](#), [procedure](#), [technique](#), [system](#); [More](#)

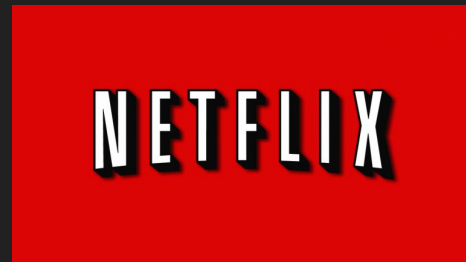
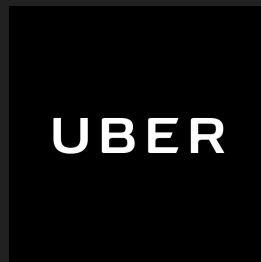
The Microservice Way

way

/wā/ 

noun

1. a method, style, or manner of doing something.
"worry was their way of showing how much they cared"
synonyms: [method](#), [process](#), [procedure](#), [technique](#), [system](#); [More](#)





This repository Search

Pull requests Issues Gist



Netflix / Hystrix

Watch 759 Star 5,974 Fork 1,097

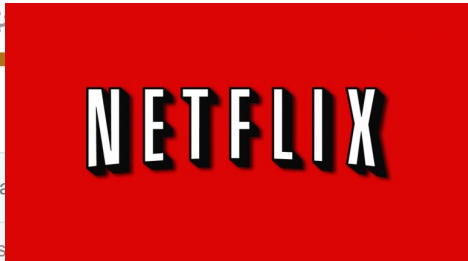
Code Issues 46 Pull requests 6 Wiki Pulse Graphs

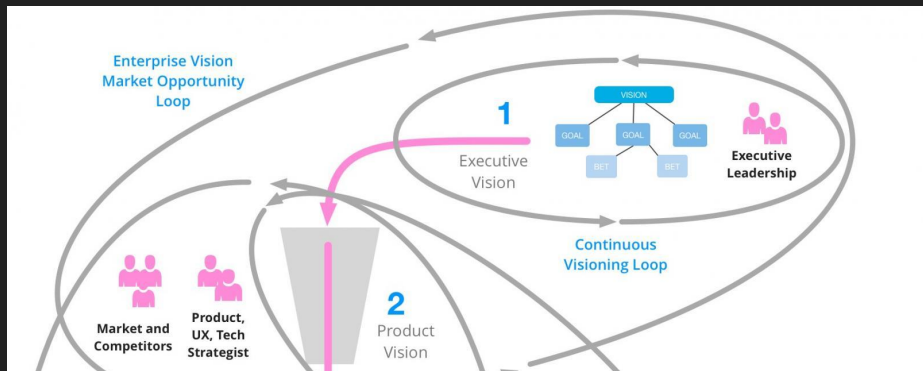
Hystrix is a latency and fault tolerance library designed to isolate points of access to remote systems, services and 3rd party libraries, stop cascading failure and enable resilience in complex distributed systems where failure is inevitable.

1,694 commits releases 74 contributors

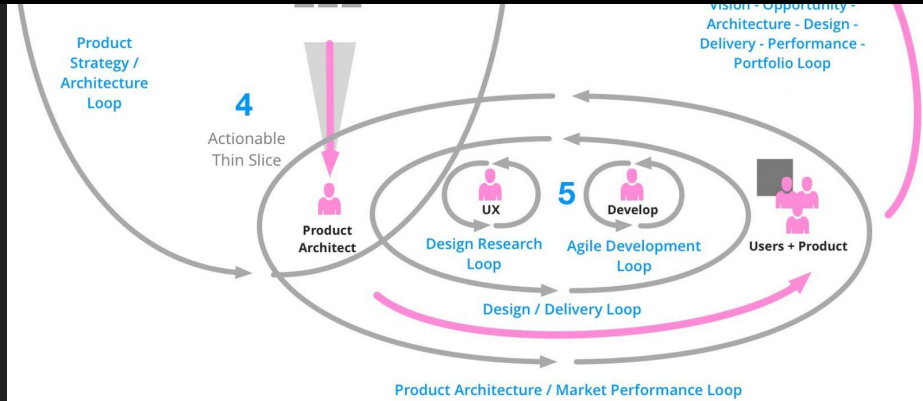
Branch: master New pull request New file Upload files Find file Clone or download

- mattjacobs** Merge pull request #1212 from mebigfa... Latest commit bca8d89 6 hours ago
- [codequality](#) Build changes... a year ago
- [gradle](#) Updated Nebula plugin to 3.2.0 and Gradle to 2.10 4 months ago
- [hystrix-contrib](#) fix logging contexts 6 hours ago
- [hystrix-core](#) fix logging contexts 6 hours ago
- [hystrix-dashboard](#) Update README.md 2 months ago
- [hystrix-examples-webapp](#) Added buffered SSE request stream that emits a collection of requests... 4 months ago



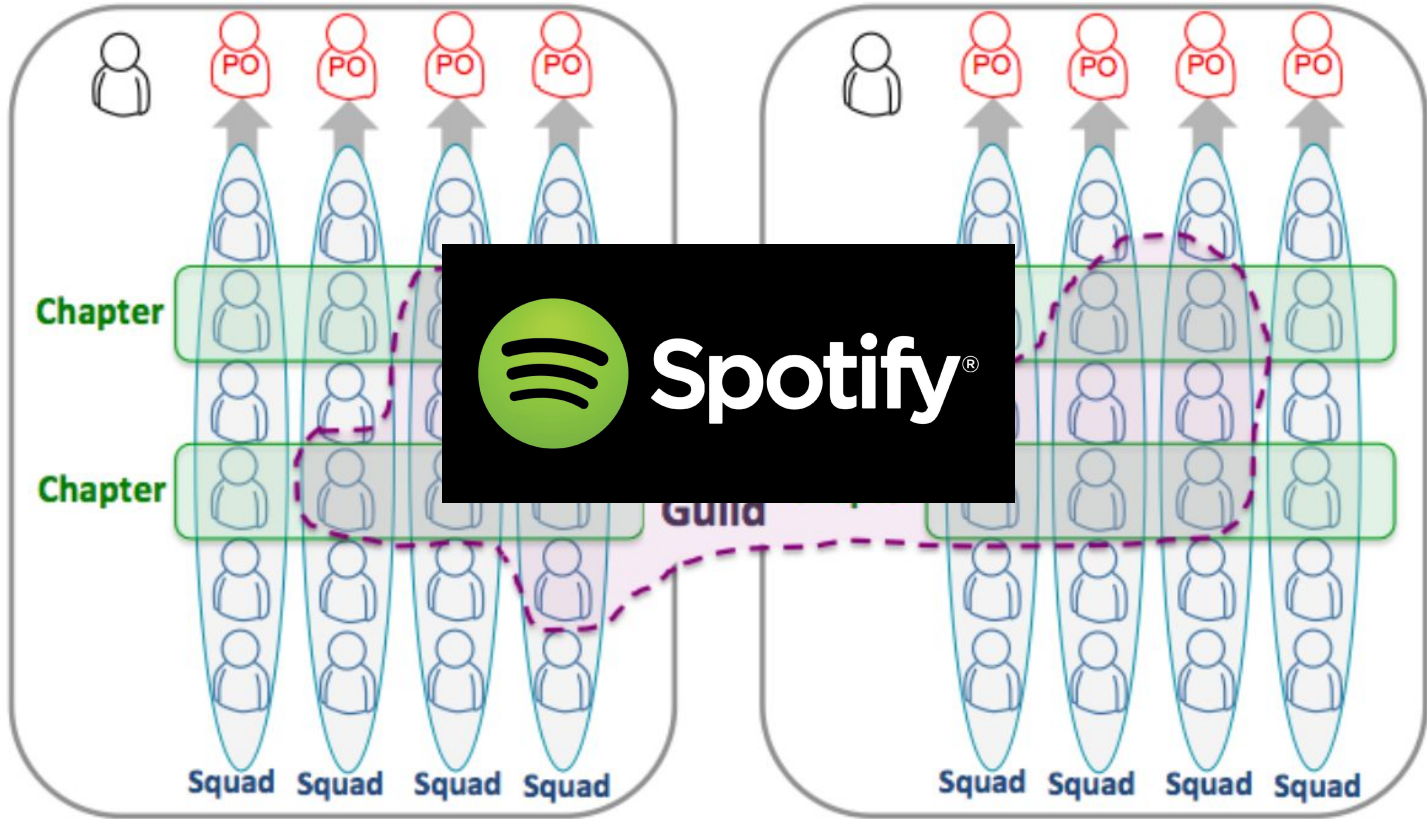


ThoughtWorks®



Tribe

Tribe



Chapter

Chapter

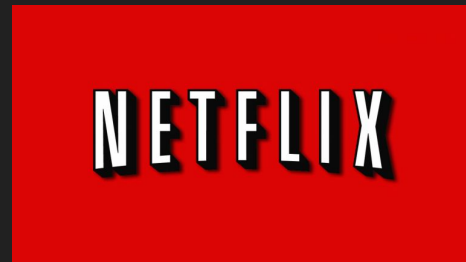
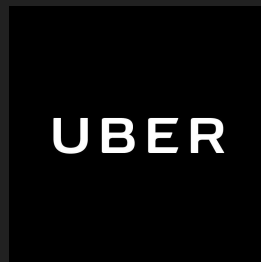
Guild

Squad Squad Squad Squad

Squad Squad Squad Squad









FLY CALIFORNIA



VAULT DOOR

WEIGHT: 22 1/2 Tons
THICKNESS: 22 Inches
STEEL: 11 Layers of Special
Cutting and Drill Resistant
LOCKS: 4 Hamilton Watch
Movements for Time Locks

DIAMOND SAFE CO.

Special
On 11/11



VAULT DOOR

WEIGHT: 22 1/2 Tons
THICKNESS: 22 Inches
STEEL: 11 Layers of Special
Cutting and Drill Resistant
LOCKS: 4 Hamilton Watch
Movements for Time Locks



The image is a 10x10 grid of 100 small, square frames. Each frame depicts a blue and yellow high-speed train in motion, passing a large, circular tunnel entrance. The train is shown from a side-on perspective, moving from left to right. The tunnel entrance is a large, circular structure with a metallic, perforated appearance. The background consists of a clear blue sky and some green foliage. The train's motion is captured with a slight blur, suggesting speed. The overall composition is a repeating pattern of the same scene, emphasizing the scale and speed of the train.

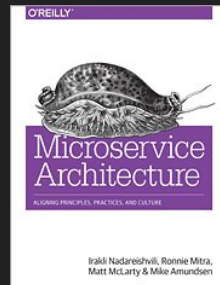
Balancing Speed and Safety at Scale

The Microservice Way



The Microservice Way

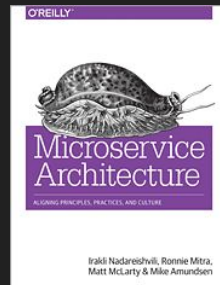
A *microservice* is an independently deployable component of bounded scope that supports interoperability through message-based communication.



The Microservice Way

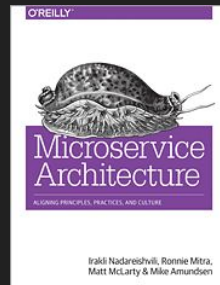
A ***microservice*** is an independently deployable component of bounded scope that supports interoperability through message-based communication.

Microservice architecture is a style of engineering highly automated, evolvable software systems made up of capability-aligned microservices.



The Microservice Way

- Microservices are ideal for **big systems**
- Microservice architecture is **goal-oriented**
- Microservices focus on **replaceability**



The price of agility is complexity...

Systematized
"Design the system"

Agility

Resiliency/
Availability

Comprehensibility

Runtime
Scalability

Organizational
Alignment

Replaceability

Cohesive
"Design the services"

Composability

Efficiency

Independent
Deployability

Testability

Modularized
"Establish the foundation"

Polyglotism

Independent
Manageability

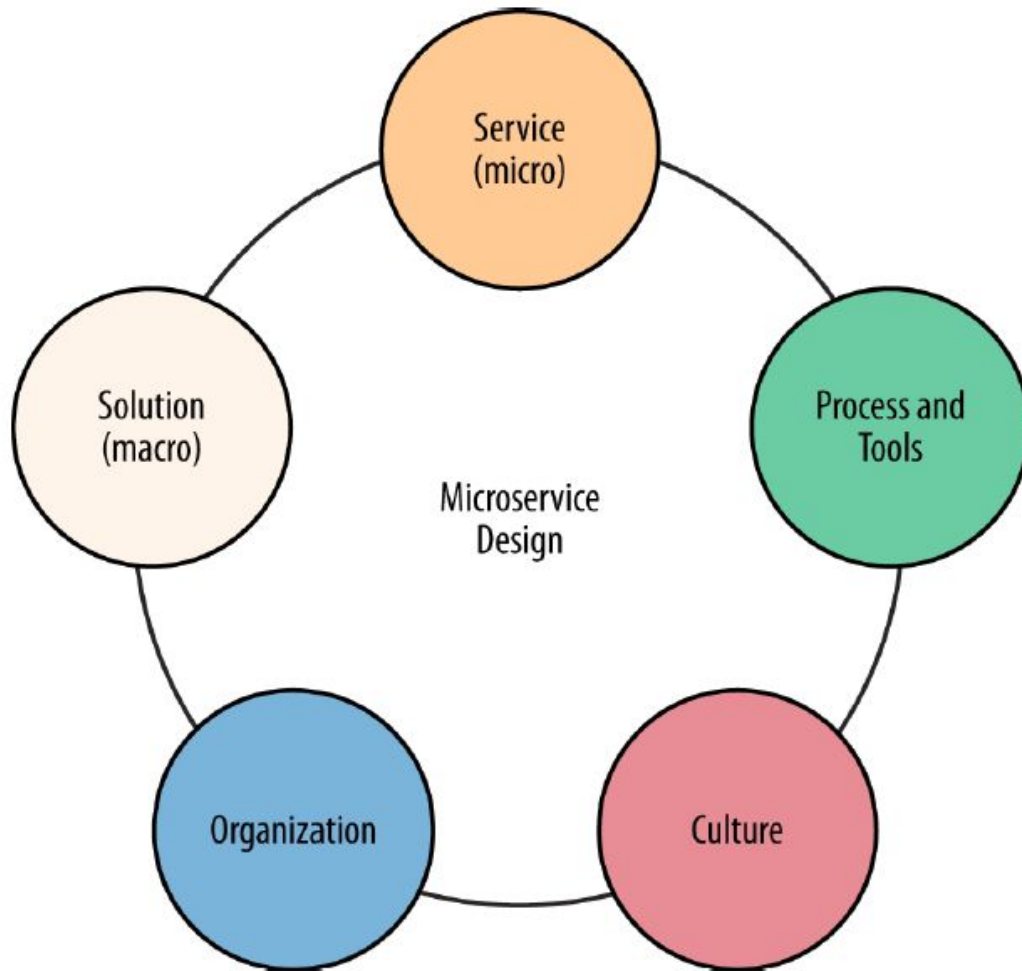
*A microservice
architecture that is...*

Speed

Safety

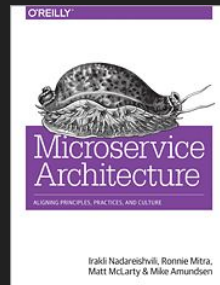
Scale & Complexity

Code is only part of the design challenge...



Microservice System Design

- Standardization and Coordination
- Process
- Outputs
- People
- Trade-Offs



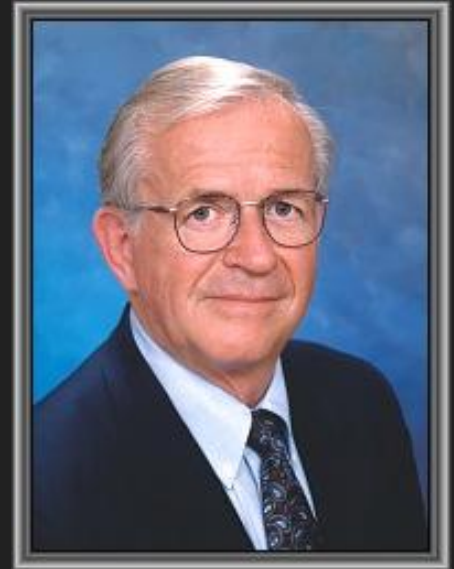
Every action affects the existing system...

Microservice System Design

“To be precise, one cannot speak of leaders who cause organizations to achieve superlative performance, for no one can cause it to happen. Leaders can only recognize and modify conditions which prevent it.”

—Dee Hock, founder/CEO of Visa

author of The Art of Chaordic Leadership



goal

/gōl/

noun

2. the object of a person's ambition or effort; an aim or desired result.

"going to law school has become the most important goal in his life"

synonyms: [objective](#), [aim](#), [end](#), [target](#), [design](#), [intention](#), [intent](#), [plan](#), [purpose](#); [More](#)

Microservice Goals

goal

/gōl/

noun

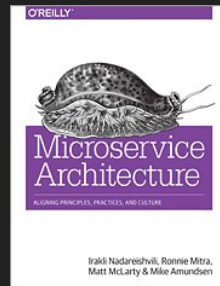
2. the object of a person's ambition or effort; an aim or desired result.

"going to law school has become the most important goal in his life"

synonyms: [objective](#), [aim](#), [end](#), [target](#), [design](#), [intention](#), [intent](#), [plan](#), [purpose](#); [More](#)

Microservice Goals

- Reduce Cost
- Increase Release Speed
- Improve Resilience
- Enable Visibility



prin·ci·ple

/ˈprɪnsəpəl/ 

noun

1. a fundamental truth or proposition that serves as the foundation for a system of belief or behavior or for a chain of reasoning.

"the basic principles of Christianity"

synonyms: truth, proposition, concept, idea, theory, assumption, fundamental, essential, ground rule

"elementary principles"

Microservice Principles

prin·ci·ple

/ˈprɪnsəpəl/ 

noun

1. a fundamental truth or proposition that serves as the foundation for a system of belief or behavior or for a chain of reasoning.

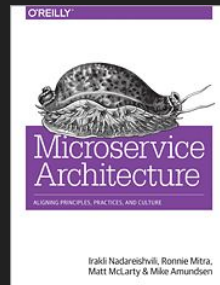
"the basic principles of Christianity"

synonyms: truth, proposition, concept, idea, theory, assumption, fundamental, essential, ground rule

"elementary principles"

Microservice Operating Principles

- Netflix
- Unix
- A Working Set



Netflix Operating Principles

- Anti-Fragility
- Immutability
- Separation of Concerns

The Netflix logo is displayed in the bottom right corner. It consists of the word "NETFLIX" in a bold, white, sans-serif font with a slight 3D effect, set against a solid red rectangular background.

NETFLIX

Unix Operating Principles (1978)

- Make each program do one thing well
- Expect the output of every program to be the input of another
- Design and build software to be tried early
- Use tools to lighten the programming task

The UNIX logo is displayed in a white square. It consists of the word "UNIX" in a bold, sans-serif font, with a diagonal slash through the letter "X".

UNIX

Suggested Operating Principles

- Do one thing well
- Build Afresh
- Expect output to become input, don't insist on interactive inputs
- Try early, don't hesitate to throw it away
- Toolmaking



ca·pa·bil·i·ty

/ˌkɑpəˈbɪlədē/

noun

power or ability.

"he had an intuitive **capability** of bringing the best out in people"

synonyms: [ability](#), [capacity](#), [power](#), [potential](#); [More](#)

- the extent of someone's or something's ability.

plural noun: **capabilities**

"the job is **beyond** my **capabilities**"

- a facility on a computer for performing a specified task.
"a graphics capability"

Microservice Capabilities

ca·pa·bil·i·ty

/ˌkɑpəˈbɪlədē/

noun

power or ability.

"he had an intuitive **capability** of bringing the best out in people"

synonyms: [ability](#), [capacity](#), [power](#), [potential](#); [More](#)

- the extent of someone's or something's ability.

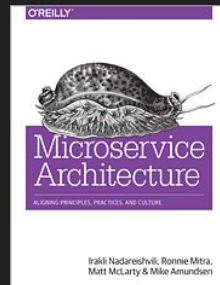
plural noun: **capabilities**

"the job is **beyond** my **capabilities**"

- a facility on a computer for performing a specified task.
"a graphics capability"

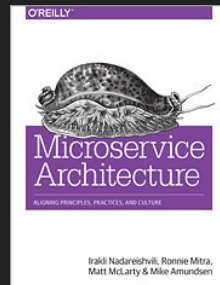
Microservice Capabilities

- Shared Capabilities
- Local Capabilities



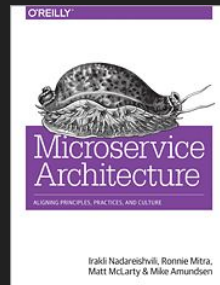
Microservice Shared Capabilities

- Hardware Services
- Code Management, Testing, Deployment
- Data Store Technologies
- Service Coordination
- Security and Identity
- Architectural Policy



Microservice Local Capabilities

- General Tooling
- Runtime configuration
- Service Discovery
- Request Routing
- System Observability



Microservice Capabilities

“You build it, you run it.”

—Verner Vogels, Amazon CTO



cul·ture

/ˈkʌltʃər/ 

noun

1. the arts and other manifestations of human intellectual achievement regarded collectively.
"20th century popular culture"
synonyms: the arts, the humanities, intellectual achievement; [More](#)
2. **BIOLOGY**
the cultivation of bacteria, tissue cells, etc., in an artificial medium containing nutrients.
"the cells proliferate readily **in culture**"

Microservice Culture

cul·ture

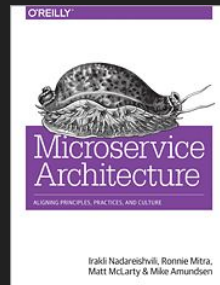
/ˈkʌlʃər/ 

noun

1. the arts and other manifestations of human intellectual achievement regarded collectively.
"20th century popular culture"
synonyms: the arts, the humanities, intellectual achievement; [More](#)
2. **BIOLOGY**
the cultivation of bacteria, tissue cells, etc., in an artificial medium containing nutrients.
"the cells proliferate readily **in culture**"

Microservice Culture

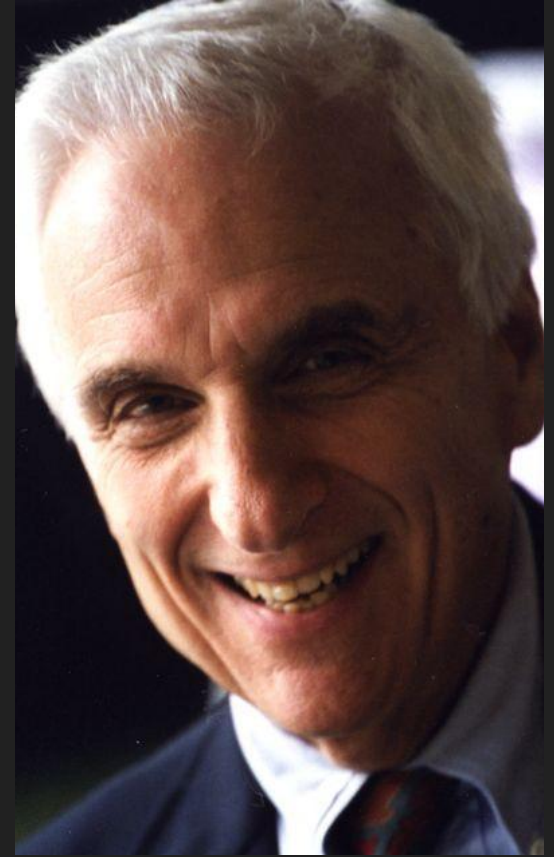
- Communication
- Team Alignment
- Fostering Innovation



Microservice Communications

“Any organization that designs a system (defined more broadly here than just information systems) will inevitably produce a design whose structure is a copy of the organization's communication structure.”

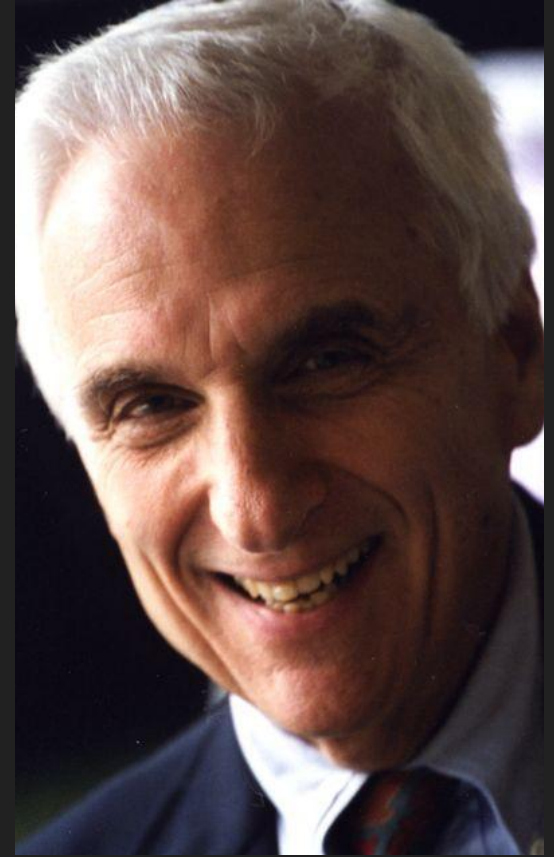
-- Mel Conway, 1967



Microservice Communications

Communication dictates design.

-- *Mel Conway, 1967*



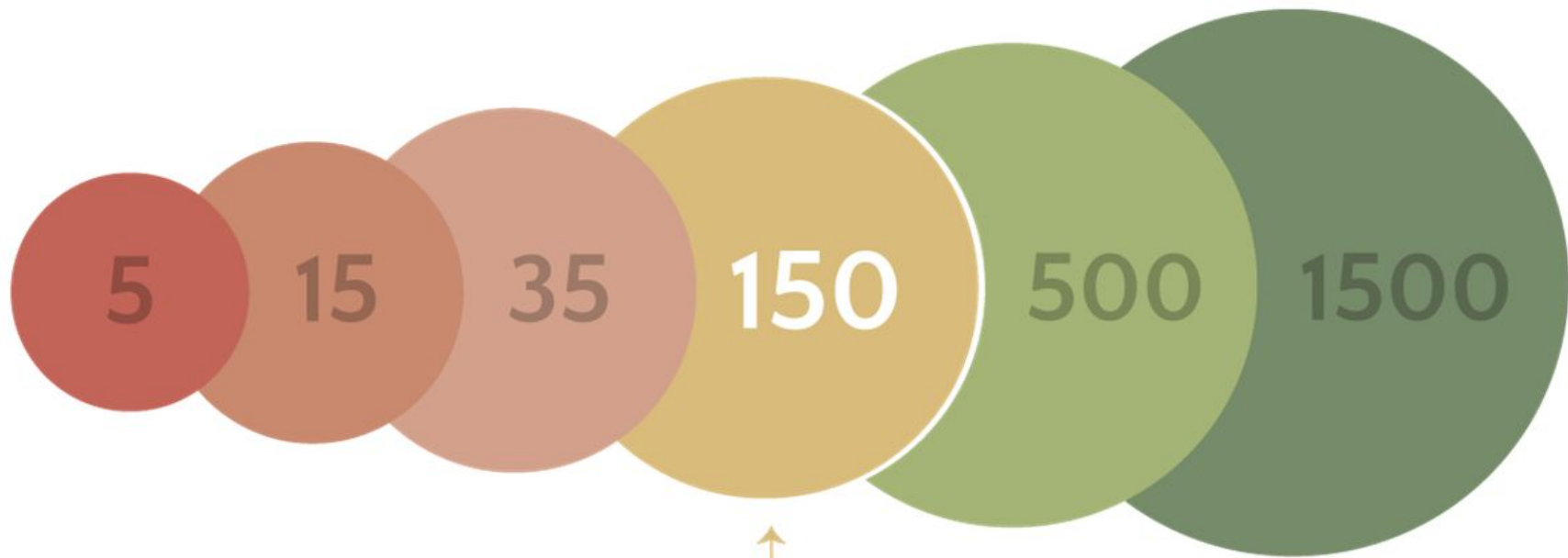
Microservice Teams

Dunbar's Number

A measurement of the “cognitive limit to the number of individuals with whom any one person can maintain stable relationships.”

-- *Robin Dunbar, 1992*

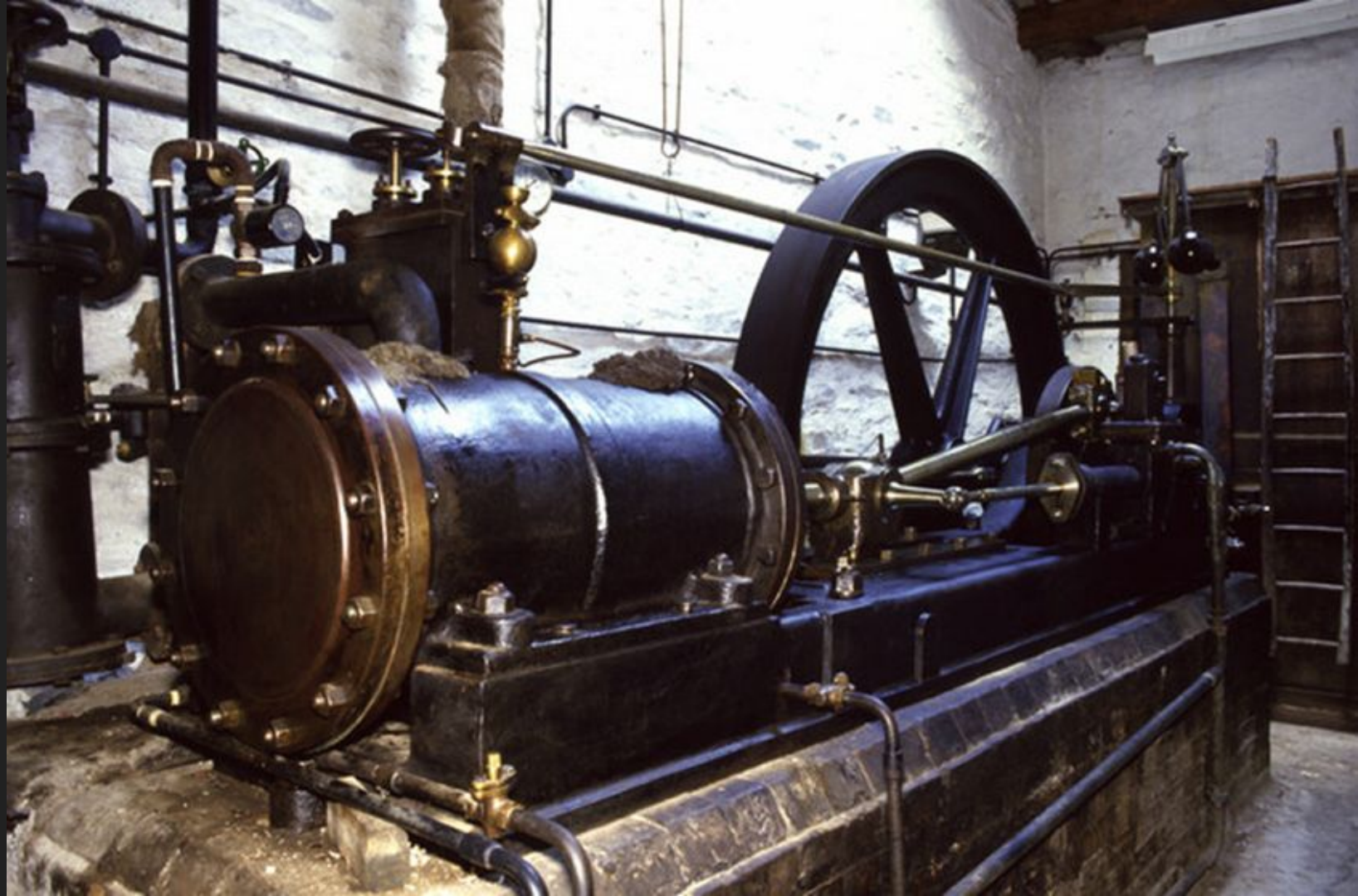




Dunbar's Number

the max number of relationships a person can maintain

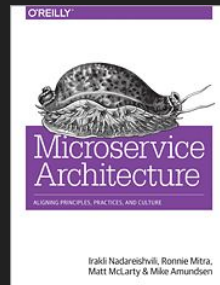






Microservice Innovation

- Central Mission, Loose Structure
- Maximize Learning
- Constant Experimentation
- Look for the Next Horizon



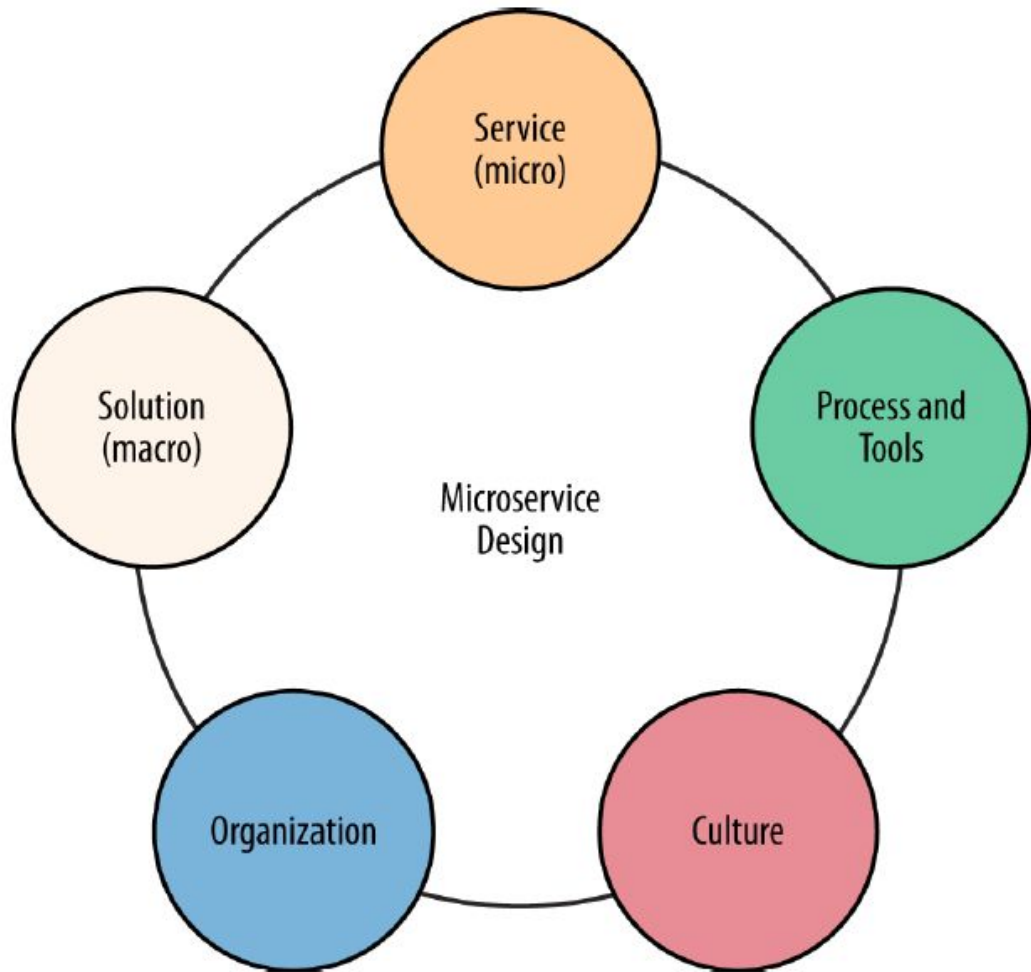
“If everything we do succeeds, then we are failing, because it means we are not taking enough risks.”

*Deborah Bull
Director of Partners
King’s College, London*

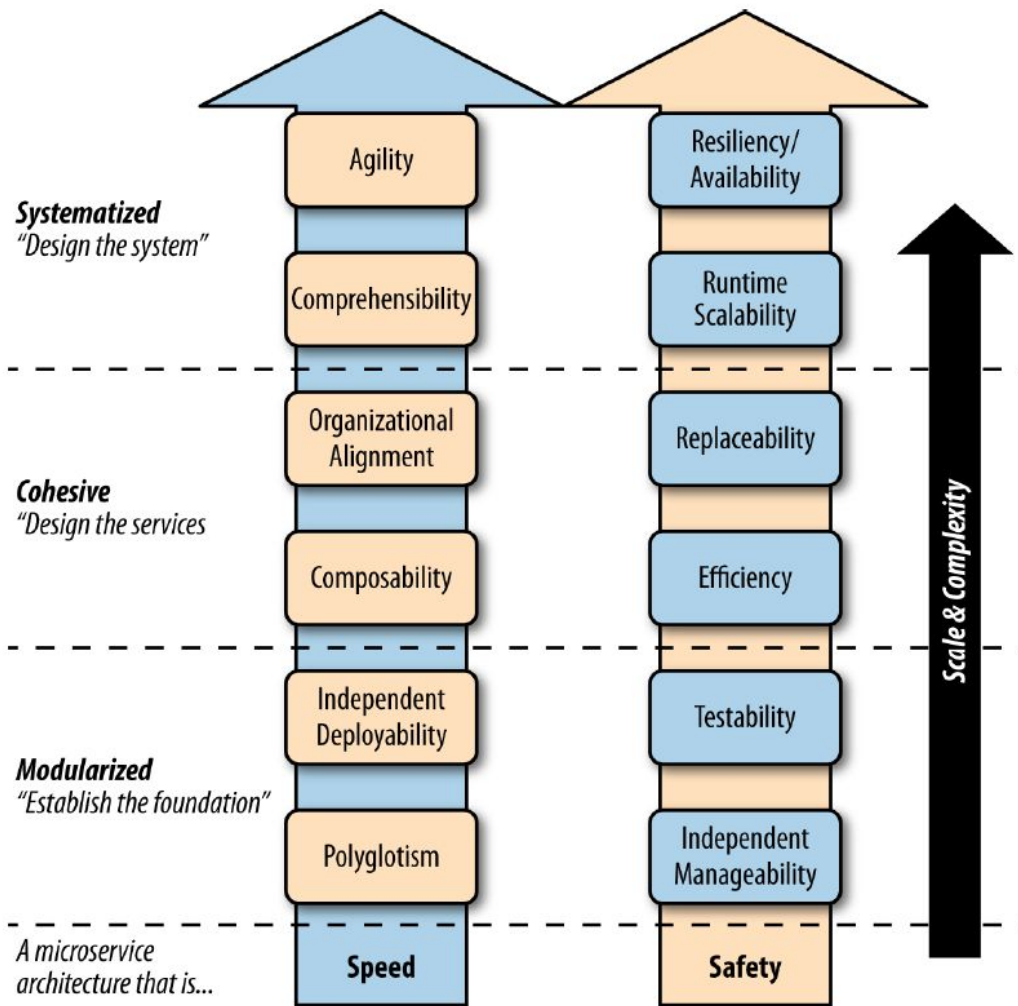


And so...

Design the whole system...



Pay attention to the complexity cost...



And above all...

A grid of 100 small images arranged in a 10x10 pattern. Each image shows a blue and yellow train moving from left to right across a dirt road. In the background, there is a large, circular tunnel entrance with a metal grate. The train is in various positions across the frames, creating a sense of motion. The background includes a blue sky with some clouds and green trees.

Balancing Speed and Safety at Scale

<http://g.mamund.com/msabook>

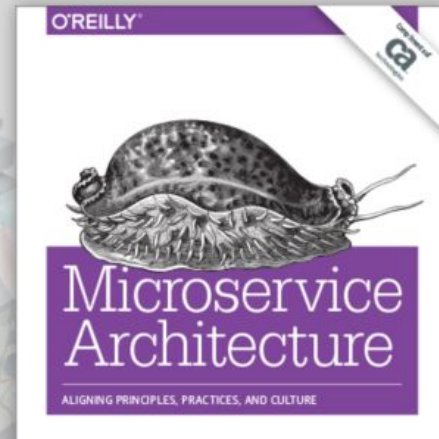


Microservice Architecture: Aligning Principles, Practices, and Culture

Microservices is the next evolution in software architecture designed to help organizations embrace continual change in the digital economy. But how do you design and apply an effective microservice architecture?

This new book from O'Reilly provides comprehensive guidance through seven valuable chapters that give you a deep-dive into:

- The benefits and principles of microservices
- A design-based approach to microservice architecture
- Lessons for applying microservices in practice





Establishing a Foundation for Microservices

Mike Amundsen
API Academy/CA Technologies
@mamund