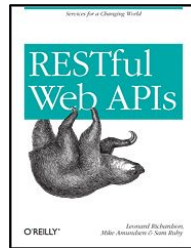# RESTful Microservices
from the Ground Up
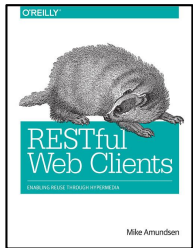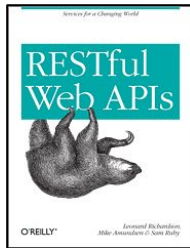
Mike Amundsen
API Academy
@mamund

API ACADEMY
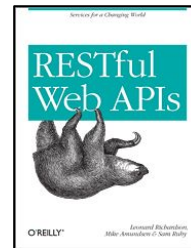
RESTful Web APIs

RESTful Web Clients

Agenda

- 9:00 - 9:45 : What are RESTful Microservices?
- 9:45 - 10:30 : Models, Messages, and Vocabularies
- 10:30 - 10:45 : BREAK
- 10:45 - 11:30 : Runtime Service Infrastructure
- 11:30 - 12:15 : The Adaptable System
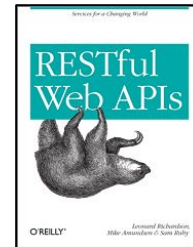- 12:15 - 12:30 : Summary

Materials

- Laptop w/ wifi
- NodeJS
- Browser and cURL
- Your favorite editor
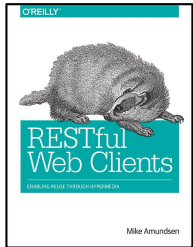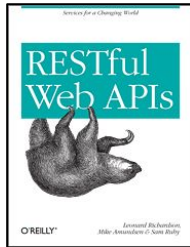- Github and Heroku
- Pen and Paper

What are RESTful Microservices?
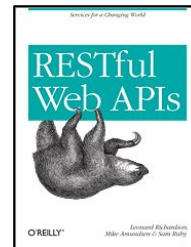
What are RESTful Microservices?
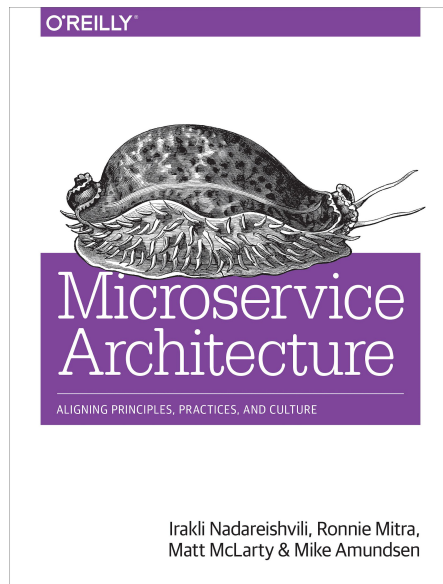
- Microservices
- RESTful-ness
- A New Kind of Service
- *Analysis Exercise*

Microservices

"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."

Microservices

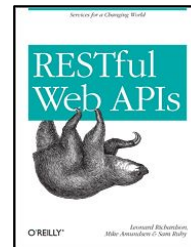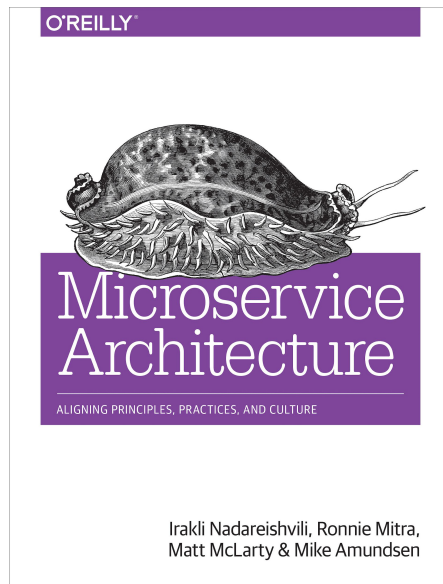"A microservice is an **independently deployable** component of bounded scope that supports interoperability through message-based communication. Microservice architecture is a style of engineering highly automated, evolvable software systems made up of capability-aligned microservices."

O'REILLY

Microservice Architecture

ALIGNING PRINCIPLES, PRACTICES, AND CULTURE

Irakli Nadareishvili, Ronnie Mitra, Matt McLarty & Mike Amundsen

Services for a Changing World

RESTful Web APIs

Leonard Richardson, Mike Amundsen & Sam Ruby

O'REILLY

O'REILLY

RESTful Web Clients

ENABLING REUSE THROUGH HYPERMEDIA

Mike Amundsen

API ACADEMY

Microservices

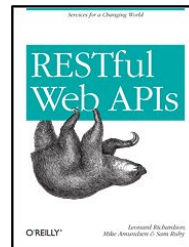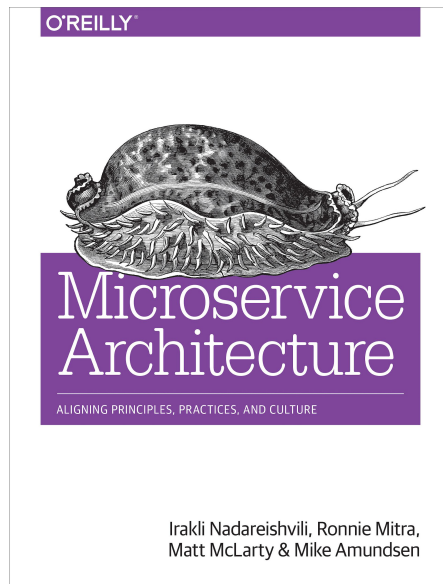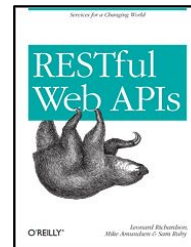*"A microservice is an* **independently deployable** *component of* **bounded scope** *that supports interoperability through message-based communication. Microservice architecture is a style of engineering highly automated, evolvable software systems made up of capability-aligned microservices."*

O'REILLY®

Microservice
Architecture

ALIGNING PRINCIPLES, PRACTICES, AND CULTURE

Irakli Nadareishvili, Ronnie Mitra,
Matt McLarty & Mike Amundsen

RESTful
Web APIs

O'REILLY®

RESTful
Web Clients

Mike Amundsen

Microservices

"A microservice is an **independently deployable** *component of* **bounded scope** *that supports interoperability through*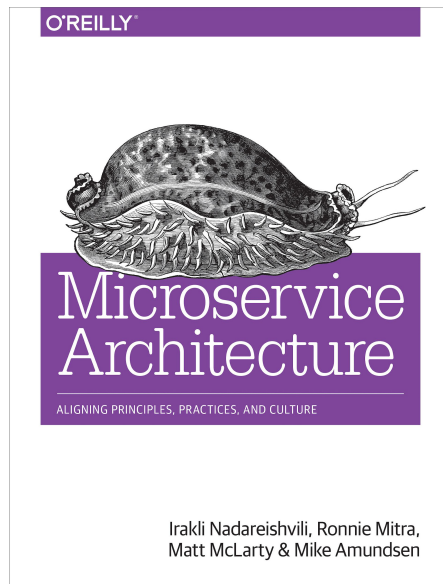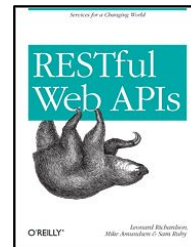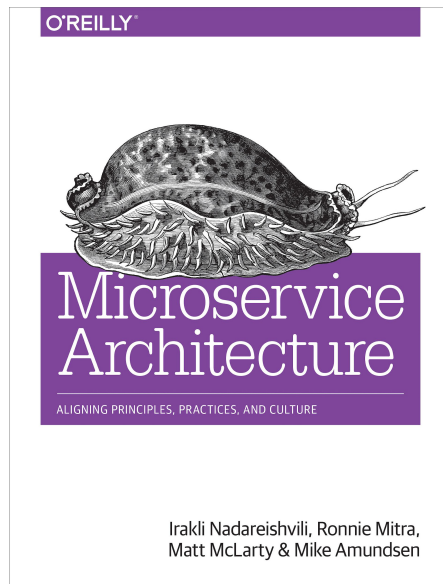 **message-based** *communication. Microservice architecture is a style of engineering highly automated, evolvable software systems made up of capability-aligned microservices."*

Microservices

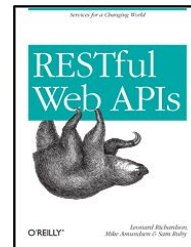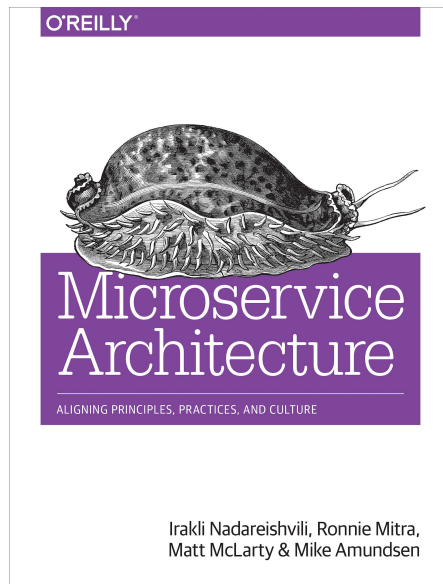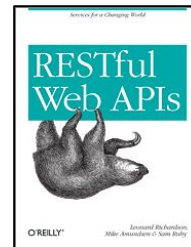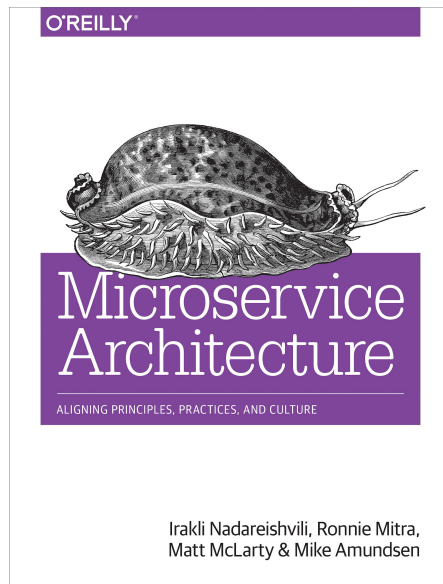*"A microservice is an **independently deployable** component of **bounded scope** that supports interoperability through **message-based** communication. Microservice architecture is a style of engineering **highly automated**, evolvable software systems made up of capability-aligned microservices."*

O'REILLY

Microservice Architecture

ALIGNING PRINCIPLES, PRACTICES, AND CULTURE

Irakli Nadareishvili, Ronnie Mitra, Matt McLarty & Mike Amundsen

API ACADEMY

RESTful Web APIs

RESTful Web Clients

Microservices

"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."*

O'REILLY

Microservice Architecture

ALIGNING PRINCIPLES, PRACTICES, AND CULTURE

Irakli Nadareishvili, Ronnie Mitra, Matt McLarty & Mike Amundsen

Services for a Changing World

RESTful Web APIs

Leonard Richardson, Mike Amundsen & Sam Ruby

O'REILLY

O'REILLY

RESTful Web Clients

ENABLING REUSE THROUGH HYPERMEDIA
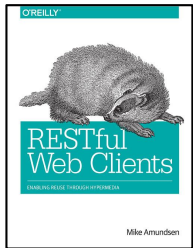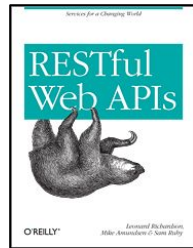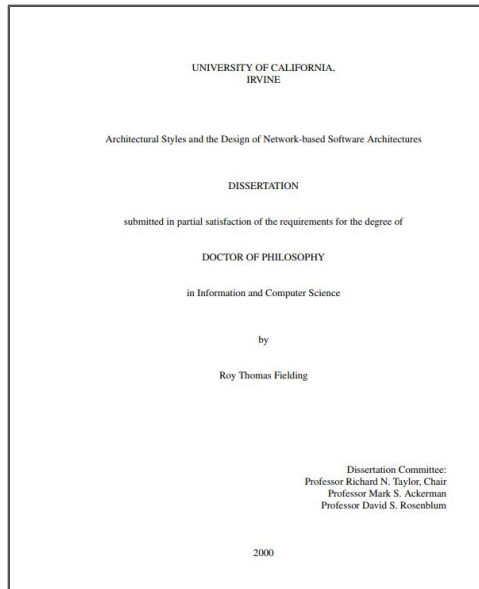
Mike Amundsen

API ACADEMY

Microservices

- Independently deployable
- Bounded scope
- Message-based
- Highly automated
- Evolvable

RESTful-ness

"This dissertation defines a framework for understanding software architecture via architectural styles and demonstrates how styles can be used to guide the architectural design of network-based application software."
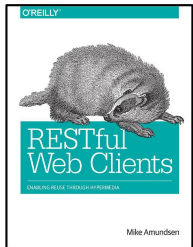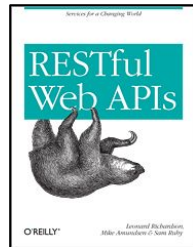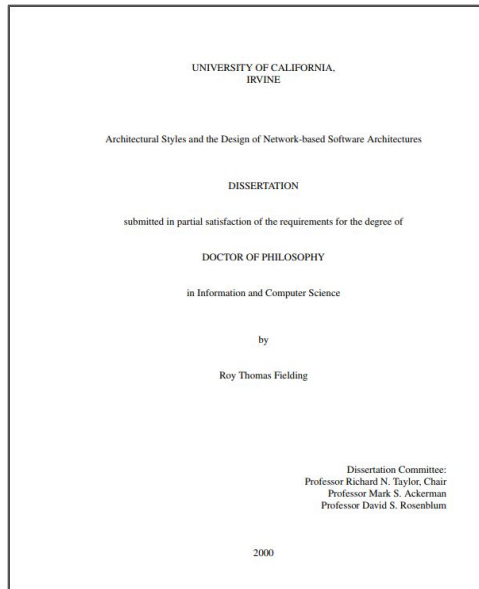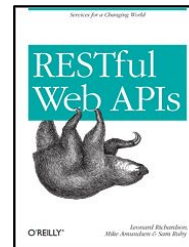
- Fielding, 2000

UNIVERSITY OF CALIFORNIA,
IRVINE

Architectural Styles and the Design of Network-based Software Architectures

DISSERTATION

submitted in partial satisfaction of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in Information and Computer Science

by

Roy Thomas Fielding

Dissertation Committee:
Professor Richard N. Taylor, Chair
Professor Mark S. Ackerman
Professor David S. Rosenblum

2000

API ACADEMY

RESTful Web APIs

RESTful Web Clients

RESTful-ness

"This dissertation defines a framework for ***understanding software architecture*** *via architectural styles and demonstrates how styles can be used to guide the architectural design of network-based application software."*

- Fielding, 2000

UNIVERSITY OF CALIFORNIA,
IRVINE

Architectural Styles and the Design of Network-based Software Architectures

DISSERTATION

submitted in partial satisfaction of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in Information and Computer Science

by

Roy Thomas Fielding

Dissertation Committee:
Professor Richard N. Taylor, Chair
Professor Mark S. Ackerman
Professor David S. Rosenblum

2000

API ACADEMY

RESTful Web APIs

RESTful Web Clients

RESTful-ness

Properties

- Performance
- Scalability
- Simplicity
- Modifiability
- Visibility
- Portability
- Reliability

RESTful-ness

Properties   + **Requirements**

- Performance
- Scalability
- Simplicity
- Modifiability
- Visibility
- Portability
- Reliability

- Low-Entry Barrier
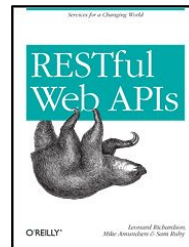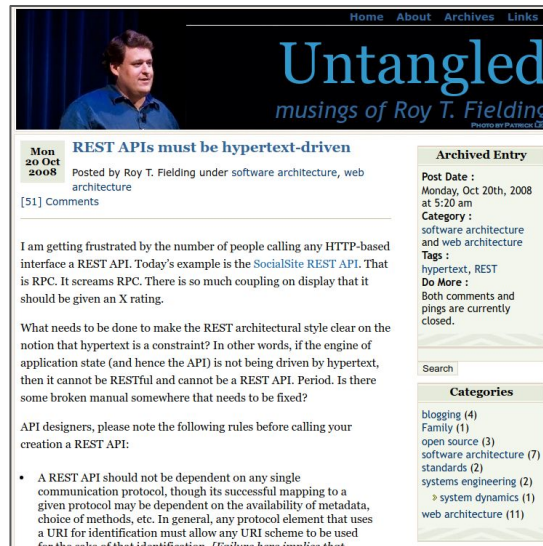- Extensibility
- Distributed Hypermedia
- Internet Scale

RESTful-ness

Properties + **Requirements** = **Constraints**

- Performance
- Scalability
- Simplicity
- Modifiability
- Visibility
- Portability
- Reliability

- Low-Entry Barrier
- Extensibility
- Distributed Hypermedia
- Internet Scale

- Client-Server
- Stateless
- Cache
- Uniform Interface
- Layered System
- Code on Demand
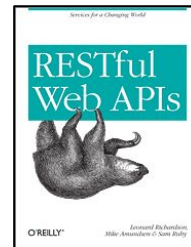
RESTful-ness

"When I say hypertext, I mean the simultaneous presentation of information and controls such that the information becomes the affordance through which the user (or automaton) obtains choices and selects actions."
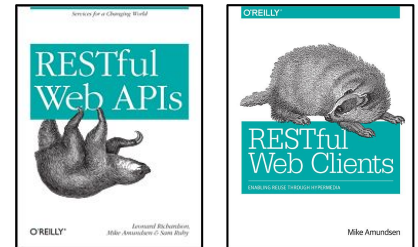
- Fielding, 2008

RESTful-ness

*"When I say hypertext, I mean the simultaneous presentation of information and controls such that the* **information becomes the affordance** *through which the user (or automaton) obtains choices and selects actions."*

- Fielding, 2008

Untangled
musings of Roy T. Fielding

REST APIs must be hypertext-driven
Posted by Roy T. Fielding under software architecture, web architecture
[51] Comments

I am getting frustrated by the number of people calling any HTTP-based interface a REST API. Today's example is the SocialSite REST API. That is RPC. It screams RPC. There is so much coupling on display that it should be given an X rating.

What needs to be done to make the REST architectural style clear on the notion that hypertext is a constraint? In other words, if the engine of application state (and hence the API) is not being driven by hypertext, then it cannot be RESTful and cannot be a REST API. Period. Is there some broken manual somewhere that needs to be fixed?

API designers, please note the following rules before calling your creation a REST API:

- A REST API should not be dependent on any single communication protocol, though its successful mapping to a given protocol may be dependent on the availability of metadata, choice of methods, etc. In general, any protocol element that uses a URI for identification must allow any URI scheme to be used for the sake of that identification.

A New Kind of Service

Analysis Exercise

Models, Messages, and Vocabularies

Models, Messages, and Vocabularies

- Models on the Inside
- Messages on the Outside
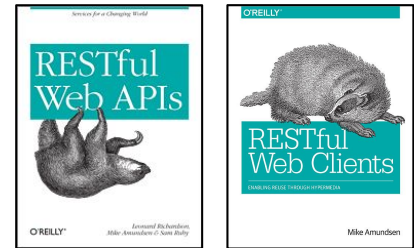- Vocabularies Everywhere
- *Design Exercise*
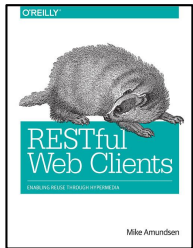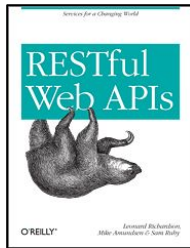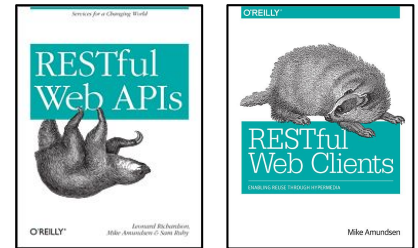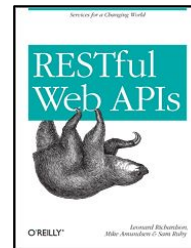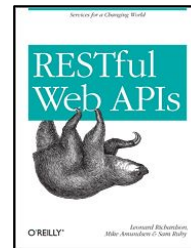
Models on the Inside

Messages on the Outside
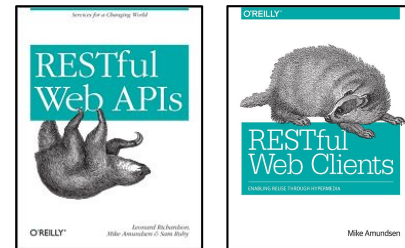
Vocabularies Everywhere

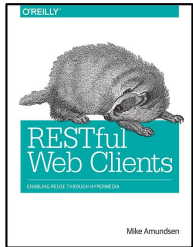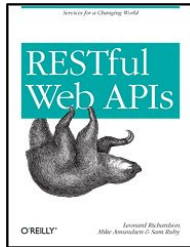# Design Exercise
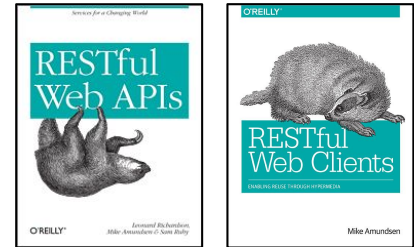
BREAK

Runtime Service Infrastructure
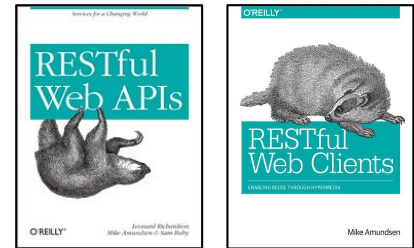
Runtime Service Infrastructure

- Advertising Services
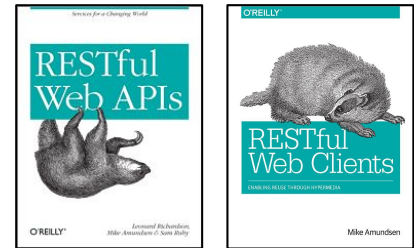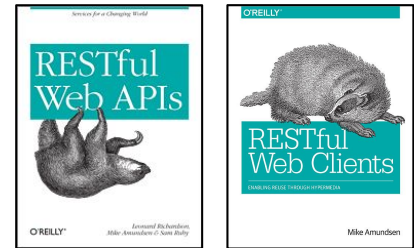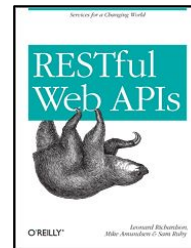- Discovering Services
- Health Checking
- *Discovery Exercise*

Advertising Services

Discovering Services

Health Checking

Discovery Exercise

The Adaptable System
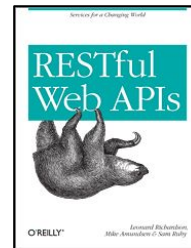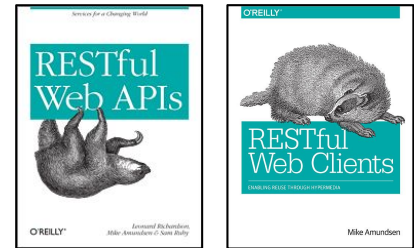
The Adaptable System

- Evolvable Providers
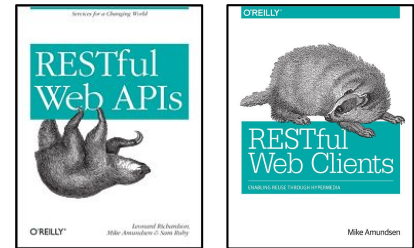- Adaptable Consumers
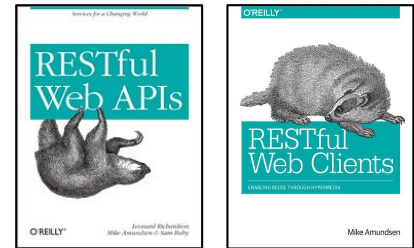- The Power of Numbers
- *Adaptation Exercises*
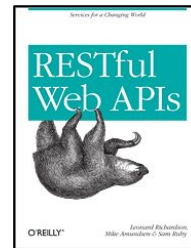
Evolvable Providers

Adaptable Consumers

The Power of Numbers
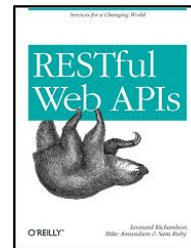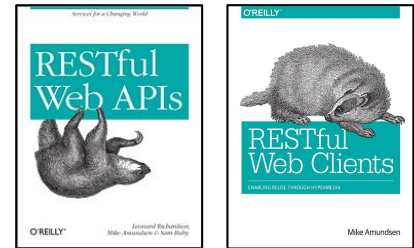
Adaptation Exercise
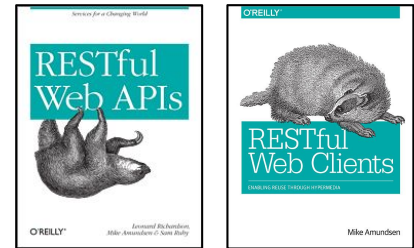
Summary

Summary

- A RESTful Approach
- Message-Oriented Implementation
- Discovery Constraints
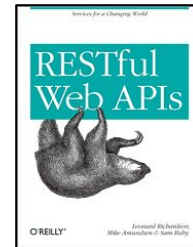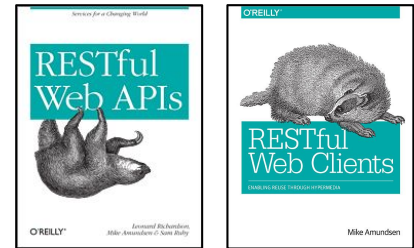- Emergent Adaptability

A RESTful Approach

Message-Oriented Implementation

Discovery Constraints

Emergent Adaptability

RESTful Microservices
from the Ground Up

Mike Amundsen

API Academy

@mamund