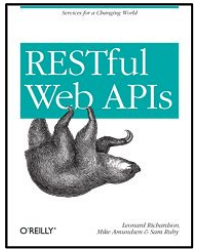
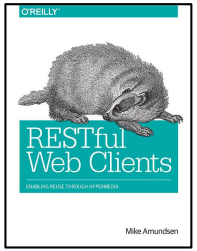
RESTful Microservices
from the Ground Up

Mike Amundsen
API Academy
@mamund

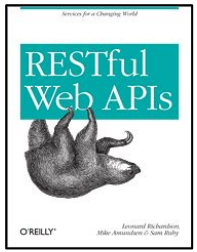


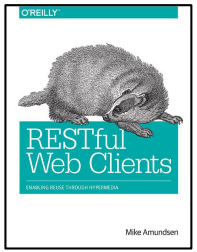


Agenda

- 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

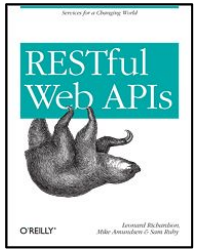
API ACADEMY

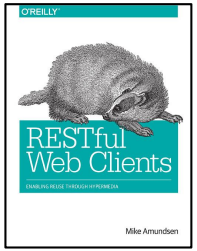




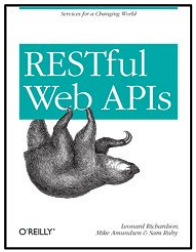
Materials

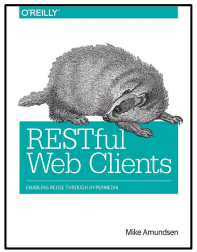
- Laptop w/ wifi
- NodeJS
- Browser and cURL
- Your favorite editor
- Github and Heroku
- Pen and Paper





What are RESTful Microservices?

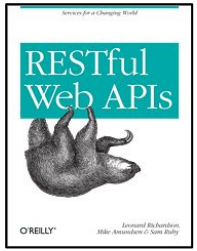


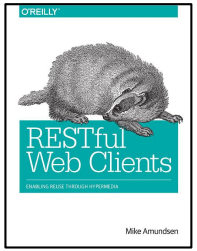


What are RESTful Microservices?

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

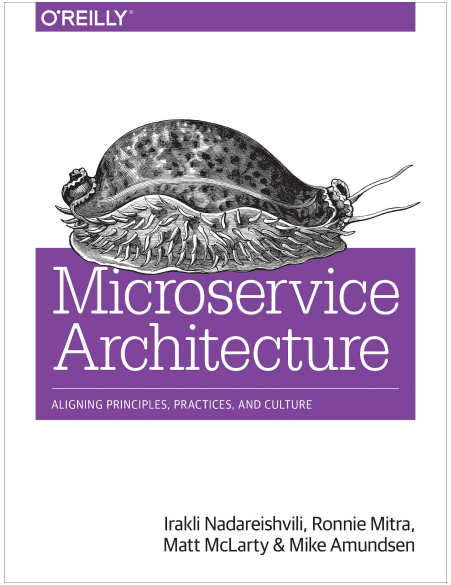
API ACADEMY



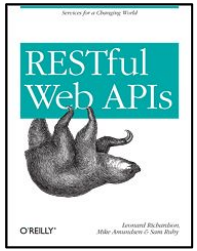


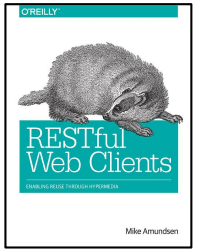
Microservices

"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."



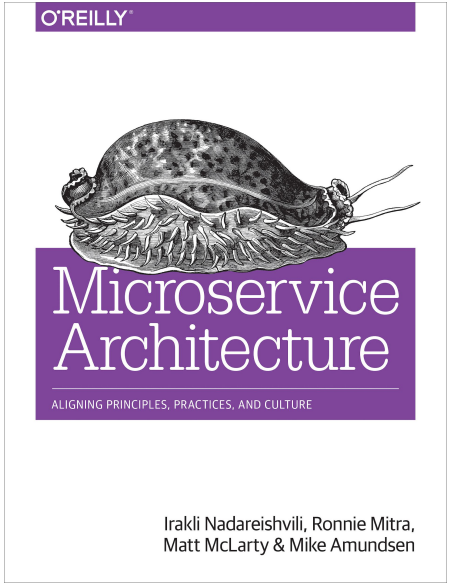
API ACADEMY



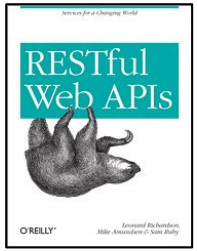


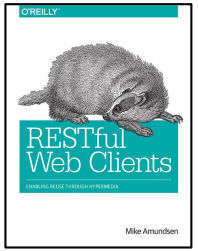
Microservices

*"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."*



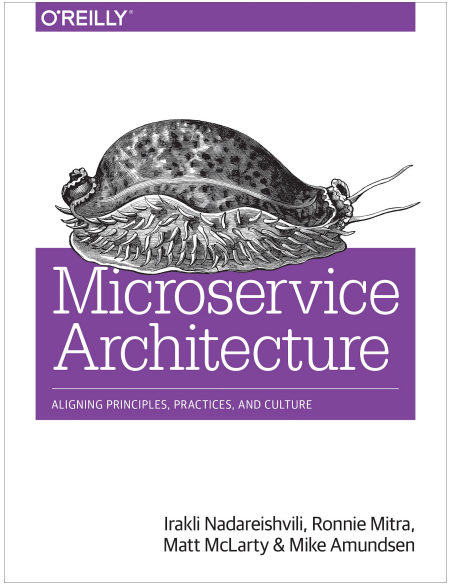
API ACADEMY



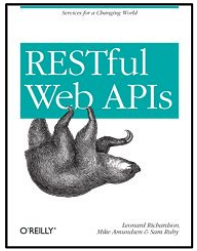


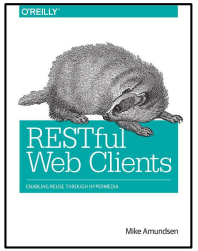
Microservices

*"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."*



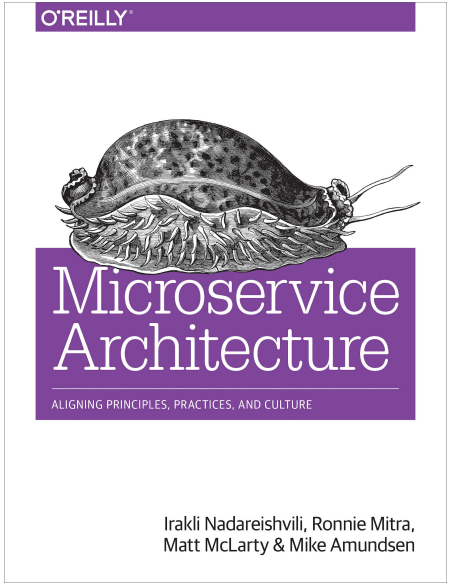
API ACADEMY



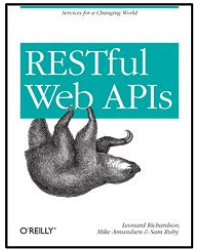


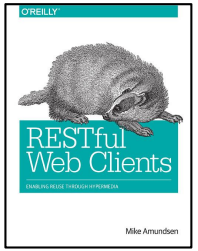
Microservices

*"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."*



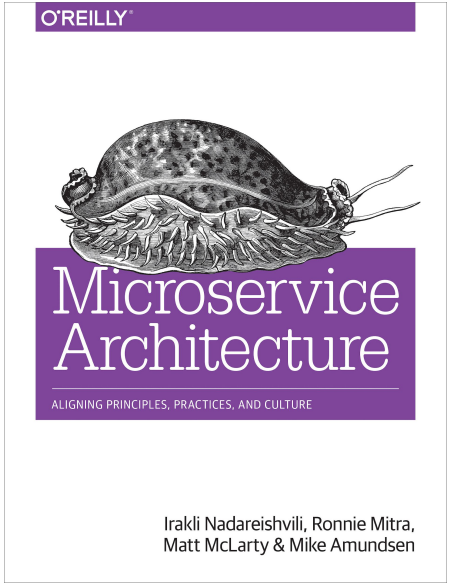
API ACADEMY



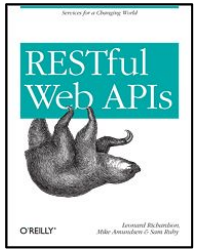


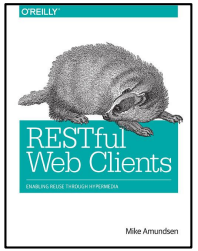
Microservices

*"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."*



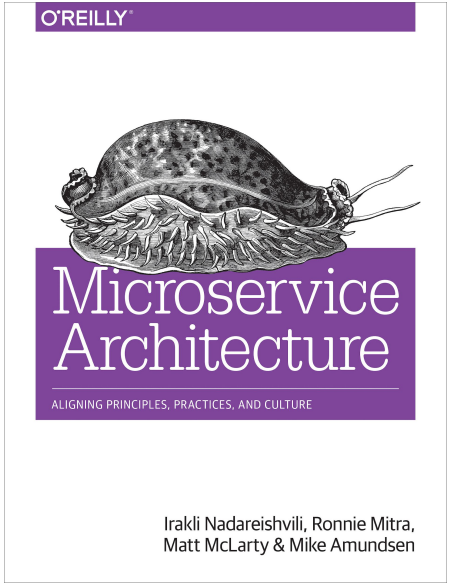
API ACADEMY



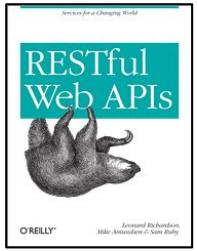


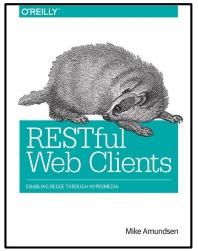
Microservices

*"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."*



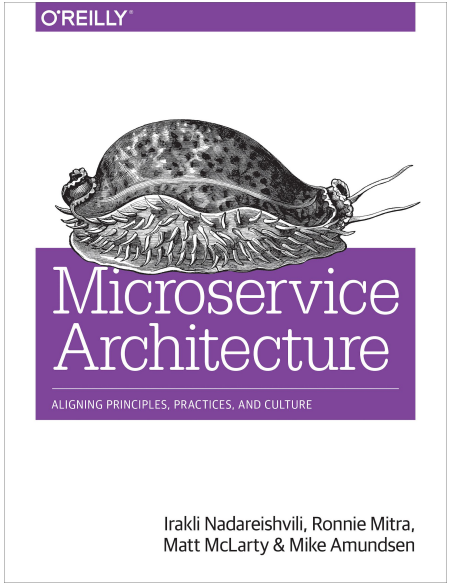
API ACADEMY



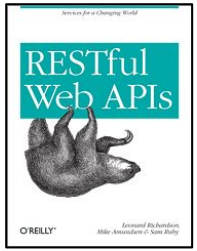


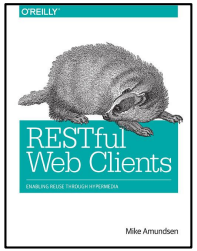
Microservices

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



API ACADEMY

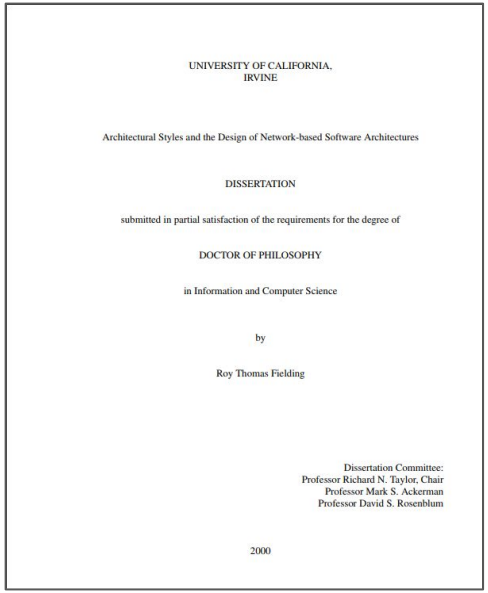




RESTful-ness

"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

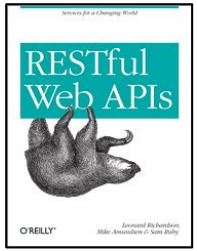
by

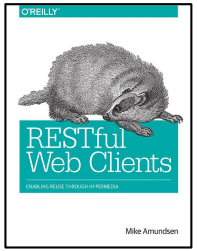
Roy Thomas Fielding

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

2000

API ACADEMY

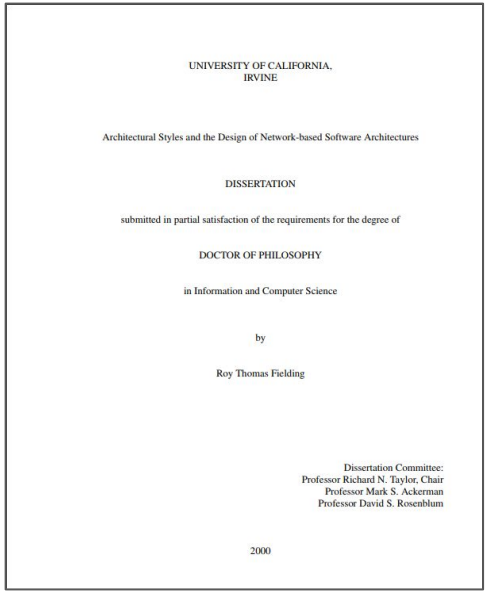




RESTful-ness

"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

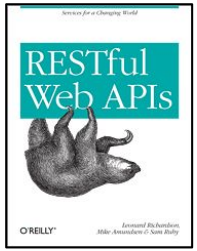
by

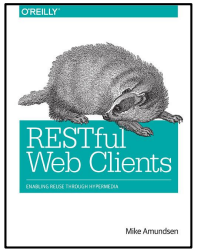
Roy Thomas Fielding

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

2000

API ACADEMY



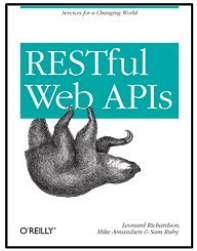


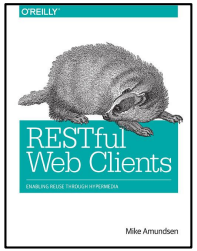
RESTful-ness

Properties

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

API ACADEMY





RESTful-ness

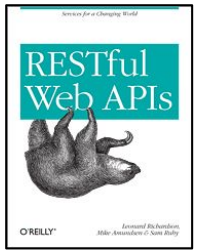
Properties

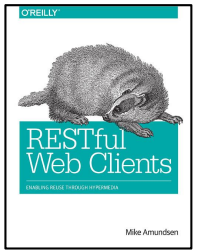
- Performance
- Scalability
- Simplicity
- Modifiability
- Visibility
- Portability
- Reliability

+ Requirements

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

API ACADEMY

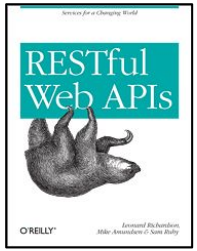


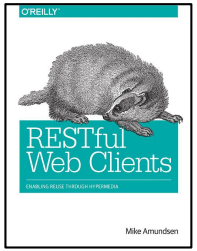


RESTful-ness

Properties	+ Requirements	= Constraints
• Performance	• Low-Entry Barrier	• Client-Server
• Scalability	• Extensibility	• Stateless
• Simplicity	• Distributed Hypermedia	• Cache
• Modifiability	• Internet Scale	• Uniform Interface
• Visibility		• Layered System
• Portability		• Code on Demand
• Reliability		

API ACADEMY

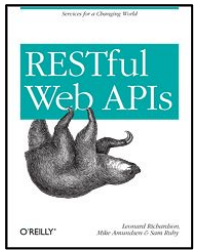


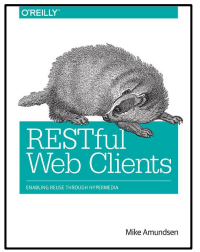


RESTful-ness

"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

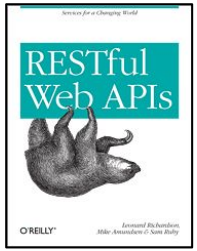


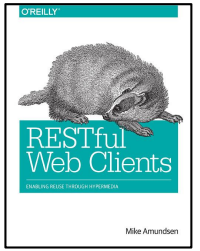


RESTful-ness

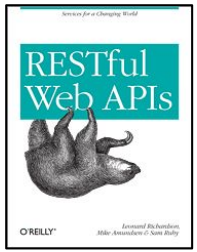
"When I say hypertext, I mean the simultaneous presentation of information and controls such that the ***information becomes the affordance*** *through which the user (or automaton) obtains choices and selects actions."*

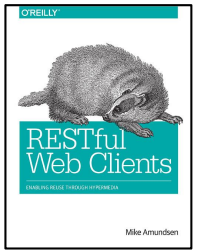
- Fielding, 2008



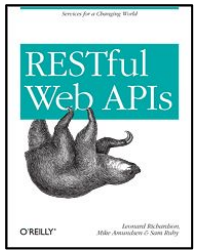


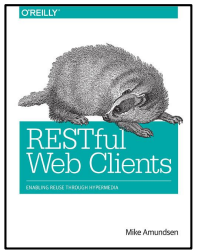
Fielding's REST ticks many of the boxes for Microservices



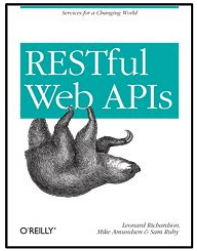


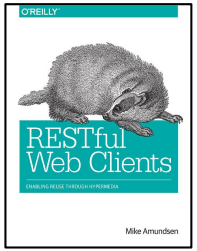
A New Kind of Service



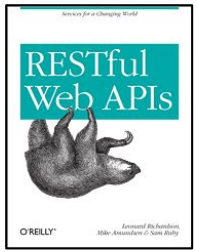


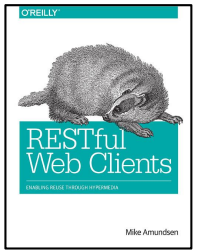
Analysis Exercise





Models, Messages, and Vocabularies

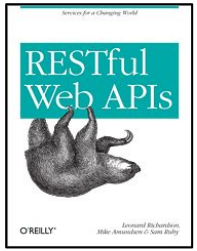


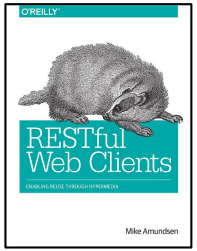


Models, Messages, and Vocabularies

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

API ACADEMY

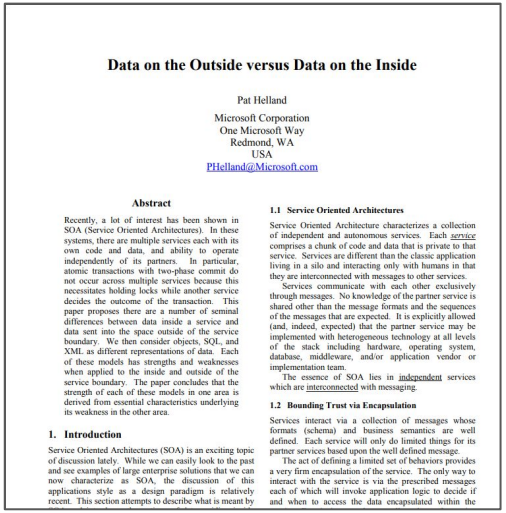




Data on the Inside vs. Data on the Outside

"This paper proposes there are a number of seminal differences between data inside a service and data sent into the space outside of the service boundary."

-- Pat Helland, 2005



Data on the Outside versus Data on the Inside

Pat Helland

Microsoft Corporation
One Microsoft Way
Redmond, WA
USA
PHelland@Microsoft.com

Abstract

Recently, a lot of interest has been shown in SOA (Service Oriented Architectures). In these systems, there are multiple services each with its own code and data, and ability to operate independently of its partners. In particular, atomic transactions with two-phase commit do not occur across multiple services because this necessitates holding locks while another service decides the outcome of the transaction. This paper proposes there are a number of seminal differences between data inside a service and data sent into the space outside of the service boundary. We then consider objects, SQL, and XML as different representations of data. Each of these models has strengths and weaknesses when applied to the inside and outside of the service boundary. The paper concludes that the strength of each of these models in one area is derived from essential characteristics underlying its weakness in the other area.

1. Introduction

Service Oriented Architectures (SOA) is an exciting topic of discussion lately. While we can easily look to the past and see examples of large enterprise solutions that we can now characterize as SOA, the discussion of this applications style as a design paradigm is relatively recent. This section attempts to describe what is meant by

1.1 Service Oriented Architectures

Service Oriented Architecture characterizes a collection of independent and autonomous services. Each service comprises a chunk of code and data that is private to that service. Services are different than the classic application living in a silo and interacting only with humans in that they are interconnected with messages to other services.

Services communicate with each other exclusively through messages. No knowledge of the partner service is shared other than the message formats and the sequences of the messages that are expected. It is explicitly allowed (and, indeed, expected) that the partner service may be implemented with heterogeneous technology at all levels of the stack including hardware, operating system, database, middleware, and/or application vendor or implementation team.

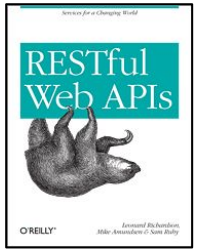
The essence of SOA lies in independent services which are interconnected with messaging.

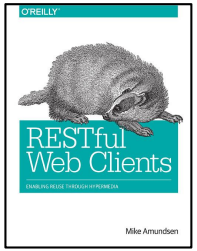
1.2 Bounding Trust via Encapsulation

Services interact via a collection of messages whose formats (schema) and business semantics are well defined. Each service will only do limited things for its partner services based upon the well defined message.

The act of defining a limited set of behaviors provides a very firm encapsulation of the service. The only way to interact with the service is via the prescribed messages each of which will invoke application logic to decide if and when to access the data encapsulated within the

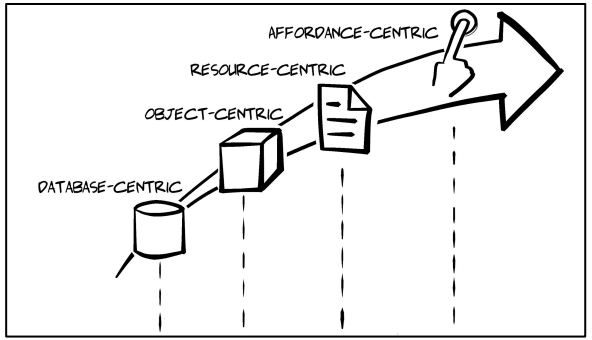
API ACADEMY



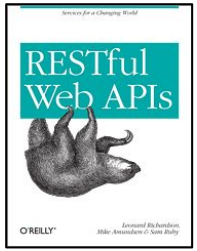


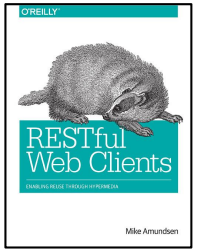
Models on the Inside

- Inside is immediate, transactional
- Data storage models (`customers.db, orders.db`)
- Programming object models (`objCustomer`)
- Inside is local, controllable
- Inside relies on a shared "now"



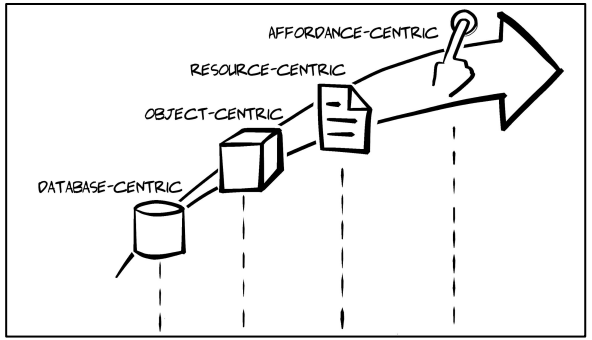
API ACADEMY



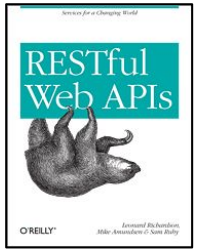


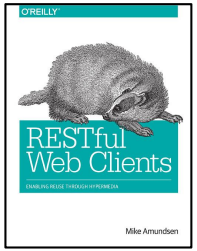
Messages on the Outside

- Outside is always in the past, non-transactional
- Resource models (`/customers/, /orders/`)
- Message models (`customer.html, order.hal`)
- Outside is remote, uncontrollable
- There is no shared "now"

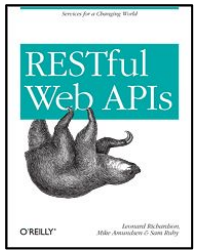


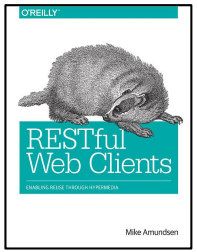
API ACADEMY





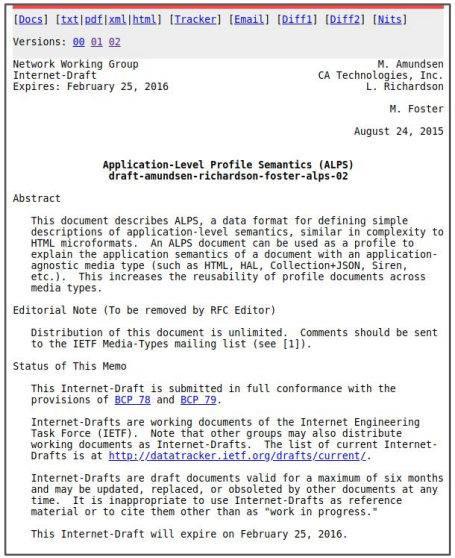
If the models are different inside and out, what is shared?





Vocabularies Everywhere

- Vocabulary is how humans share (language, slang, etc.)
- We use the same vocabulary for many models
- Vocabularies delineate domains (medicine, IT, etc.)
- IT vocabularies already exist:
  - Dublin Core
  - schema.org
  - microformats
  - IANA Link Relation Values
- ALPS is a media-type and protocol independent description format



[Docs] [txt|pdf|xml|html] [Tracker] [Email] [Diff1] [Diff2] [Nits]

Versions: 00 01 02

Network Working Group
Internet-Draft
Expires: February 25, 2016

M. Amundsen
CA Technologies, Inc.
L. Richardson

M. Foster

August 24, 2015

Application-Level Profile Semantics (ALPS)
draft-amundsen-richardson-foster-alps-02

Abstract

This document describes ALPS, a data format for defining simple descriptions of application-level semantics, similar in complexity to HTML microformats. An ALPS document can be used as a profile to explain the application semantics of a document with an application-agnostic media type (such as HTML, HAL, Collection+JSON, Siren, etc.). This increases the reusability of profile documents across media types.

Editorial Note (To be removed by RFC Editor)

Distribution of this document is unlimited. Comments should be sent to the IETF Media-Types mailing list (see [1]).

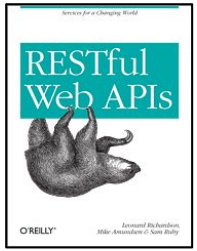
Status of This Memo

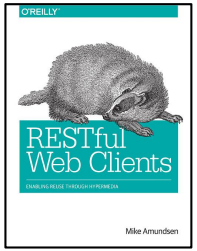
This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at http://datatracker.ietf.org/drafts/current/.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

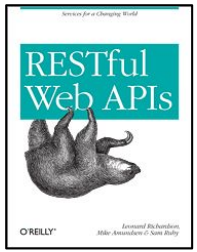
This Internet-Draft will expire on February 25, 2016.

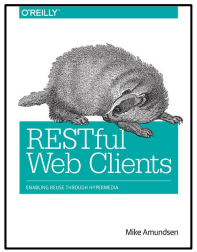




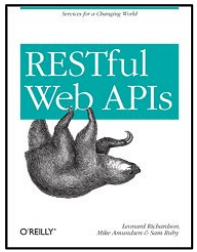
API ACADEMY

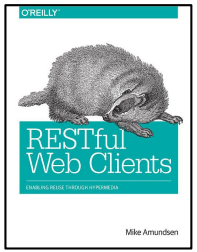
Design Exercise



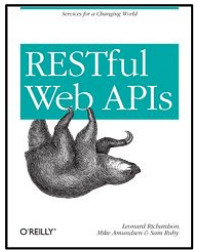


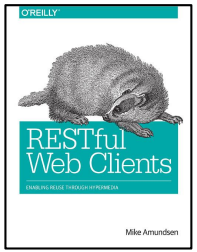
BREAK


RESTful
Web APIs
O'REILLY


O'REILLY
RESTful
Web Clients
Mike Amundsen

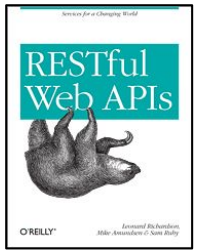
Runtime Service Infrastructure

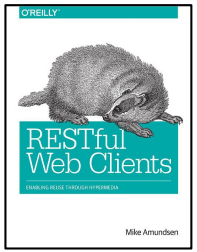




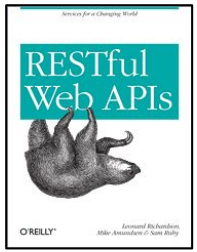
Runtime Service Infrastructure

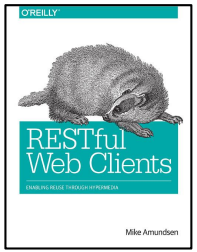
- Advertising Services
- Discovering Services
- Health Checking
- *Discovery Exercise*



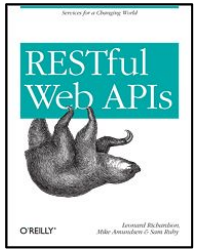


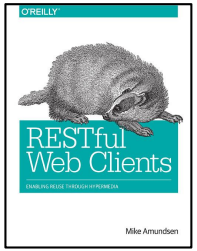
Advertising Services



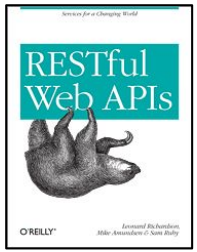


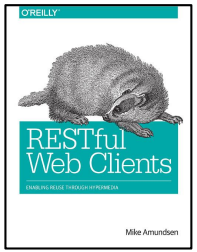
Discovering Services



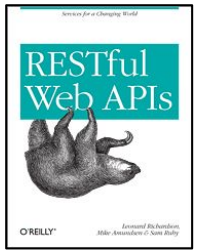


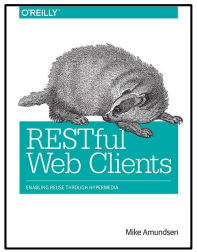
Health Checking



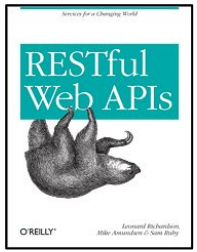


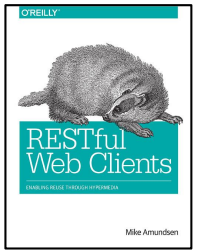
Discovery Exercise





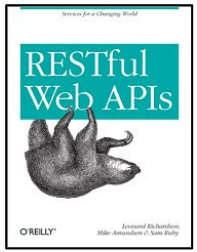
The Adaptable System

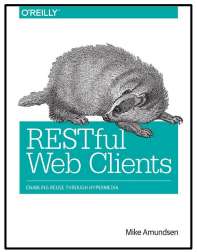




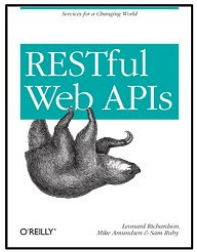
The Adaptable System

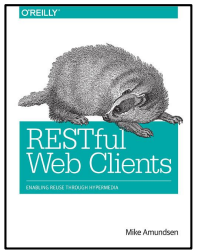
- Evolvable Providers
- Adaptable Consumers
- The Power of Numbers
- *Adaptation Exercises*



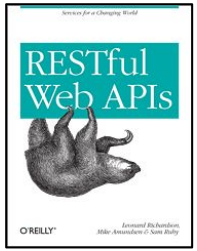


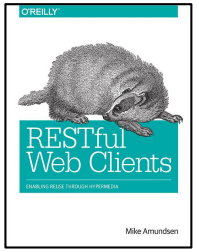
Evolvable Providers



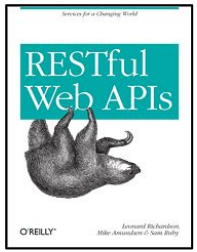


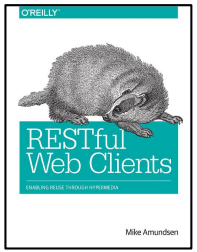
Adaptable Consumers



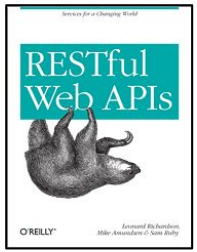


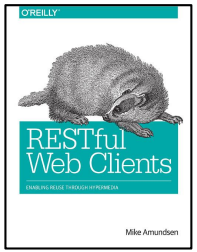
The Power of Numbers



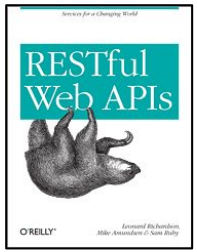


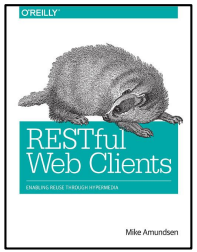
Adaptation Exercise





Summary

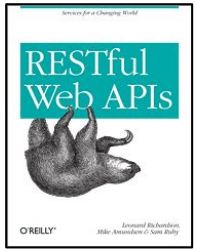

RESTful
Web APIs
O'REILLY

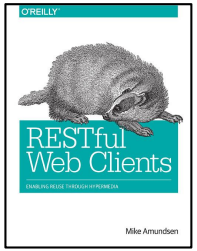

O'REILLY
RESTful
Web Clients
Mike Amundsen

Summary

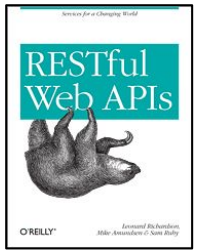
- A RESTful Approach
- Message-Oriented Implementation
- Discovery Constraints
- Emergent Adaptability

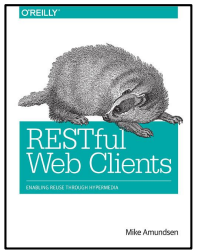
API ACADEMY



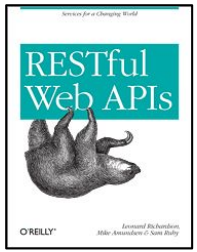


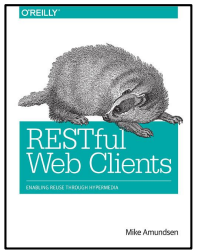
A RESTful Approach



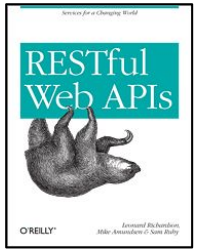


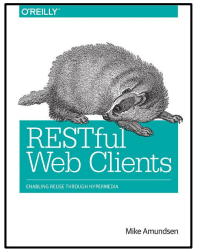
Message-Oriented Implementation



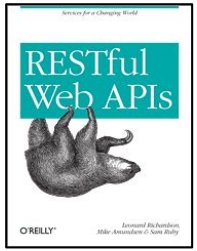


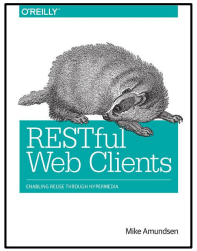
Discovery Constraints





Emergent Adaptability





RESTful Microservices
from the Ground Up

Mike Amundsen
API Academy
@mamund