

A scenic view of a forest with a clear blue sky in the background. The foreground is filled with dense green trees, and the background shows a hazy horizon line under a clear sky.

Scaling the Future

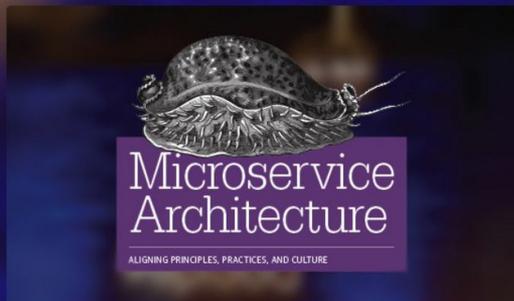
Mike Amundsen
@mamund
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EBOOK



MICROSERVICE ARCHITECTURE: ALIGNING PRINCIPLES, PRACTICES & CULTURE

DESIGN AND APPLY MICROSERVICES TO EMBRACE CONTINUAL
CHANGE IN THE DIGITAL ECONOMY

READ MORE

Creating Evolvable Hypermedia Applications



Building

Hypermedia APIs with HTML5 & Node

O'REILLY®

Mike Amundsen

Services for a Changing World

RESTful Web APIs



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*Leonard Richardson,
Mike Amundsen & Sam Ruby*

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RESTful Web Clients

ENABLING REUSE THROUGH HYPERMEDIA

Mike Amundsen

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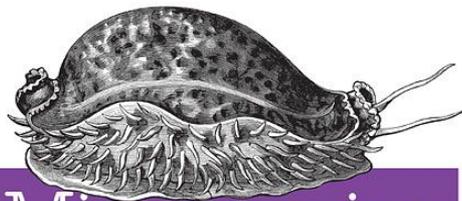
Services for a Changing World

RESTful APIs



*Leonard Richardson,
Mike Amundsen & Sam Ruby*

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Microservice Architecture

ALIGNING PRINCIPLES, PRACTICES, AND CULTURE

*Irakli Nadareishvili, Ronnie Mitra,
Matt McLarty & Mike Amundsen*

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RESTful Web Clients

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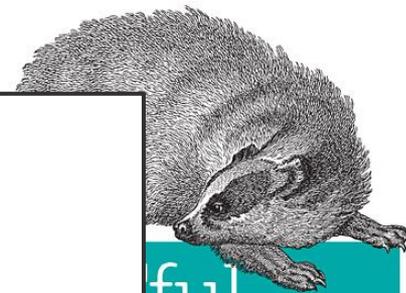
Services for a Changing World

RESTful
API



Mike A

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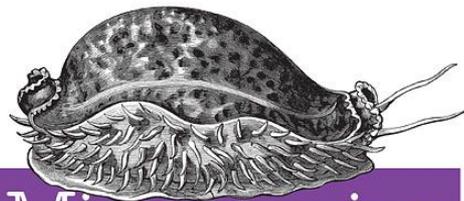


RESTful
Clients

HYPERMEDIA

Mike Amundsen

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Microservice
Architecture

ALIGNING PRINCIPLES, PRACTICES, AND CULTURE

Irakli Nadareishvili, Ronnie Mitra,
Matt McLarty & Mike Amundsen

Design and Build Great APIs

Mike Amundsen

The Pragmatic Bookshelf
Raleigh, North Carolina

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

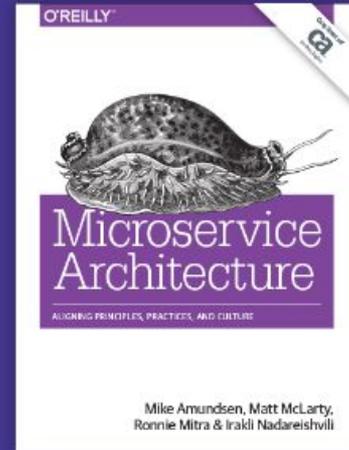


Microservice Architecture: Aligning Principles, Practices, and Culture

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 book 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



Scaling



scale³

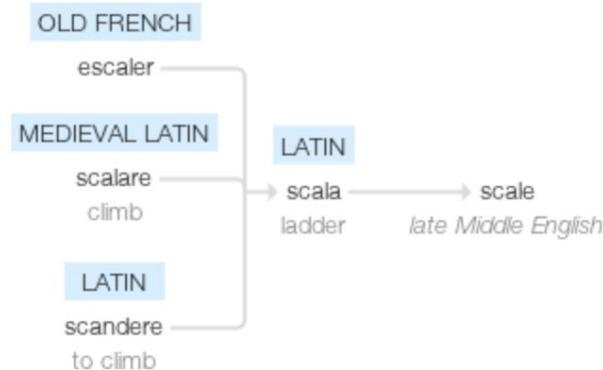
/skāl/ 

verb

gerund or present participle: **scaling**

1. climb up or over (something high and steep).
"thieves scaled an 8-foot fence"
synonyms: climb, ascend, go up, clamber up, scramble up, mount, shinny (up); historical escalade
"thieves scaled the fence"
2. represent in proportional dimensions; reduce or increase in size according to a common scale.
"scaled plans of the house"
 - (of a quantity or property) be variable according to a particular scale.

Origin



Networks

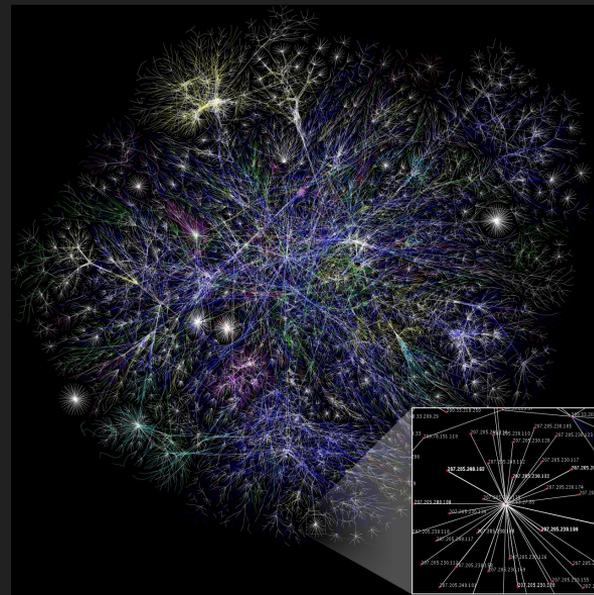
Traveling

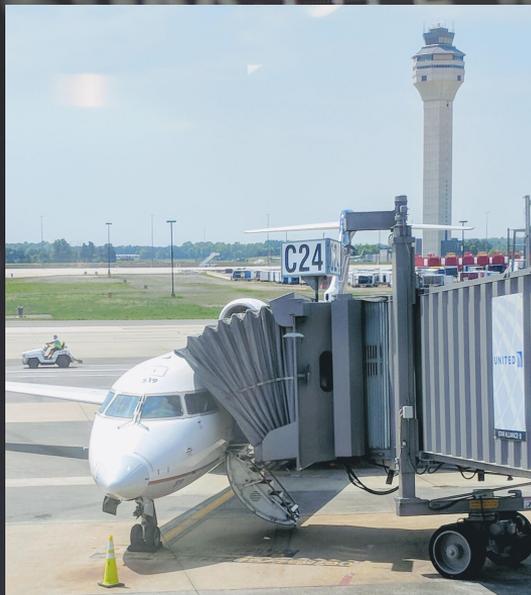


Traveling

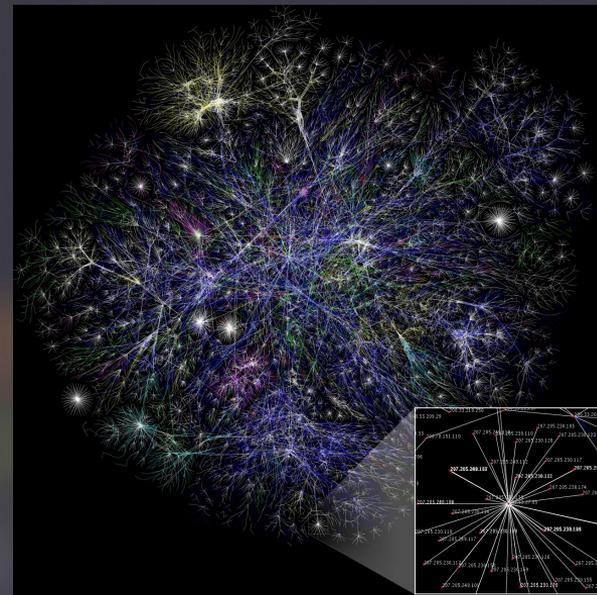


Traveling the Network





Programming the Network



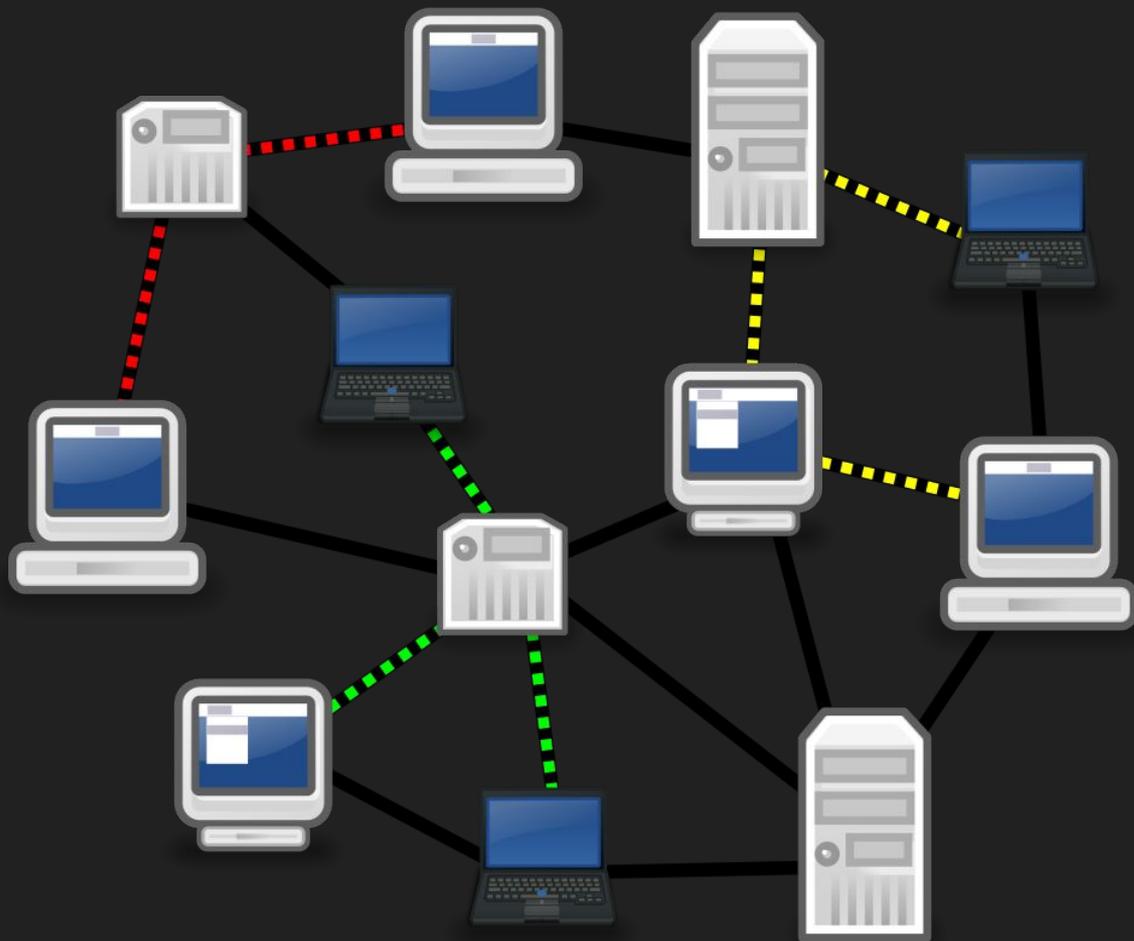
RedBoot(tm) bootstrap and debug environment [RAM]
(Panasonic Avionics Corporation) release, version ("560328-212" v "1.07" b "0126"
- built 15:35:59, May 22 2013

Platform: SM-02 (I386)
Copyright (C) 2000, 2001, 2002, Red Hat, Inc.

RAM: 0x00000000-0x000a0000, 0x00100000-0x01000000 available
Current Boot Count is 0

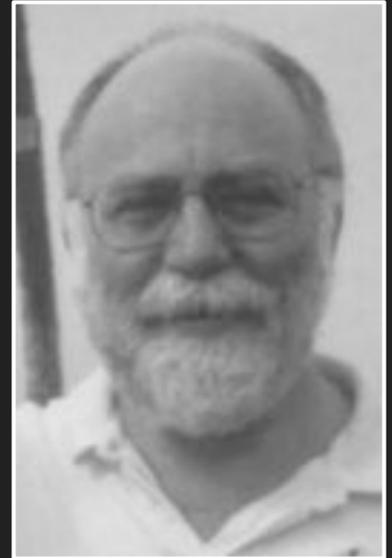
verifying MBR... Fix MBR:
Partition 0: already exists
Partition 1: already exists
Partition 2: already exists
Partition 3: already exists

verifying image... OK.
== Executing kernel in 5 seconds - enter ^C to abort
Load Address 0x00000000
Image length 0x00e2f5d5
Loading kernel binary...
Read image signature... 1f 8b
Decompressing image...



Fallacies of Distributed Computing (1994)

1. The network is reliable.
2. Latency is zero.
3. Bandwidth is infinite.
4. The network is secure.
5. Topology doesn't change.
6. There is one administrator.
7. Transport cost is zero.
8. The network is homogeneous.



L Peter Deutsch

Programming the Network

"There is no simultaneity at a distance."

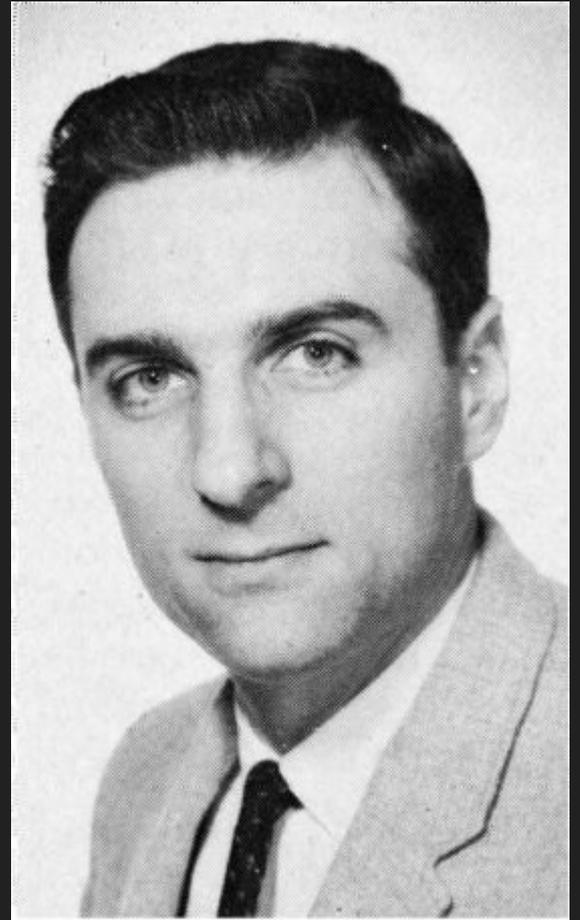
-- Pat Helland (2005)



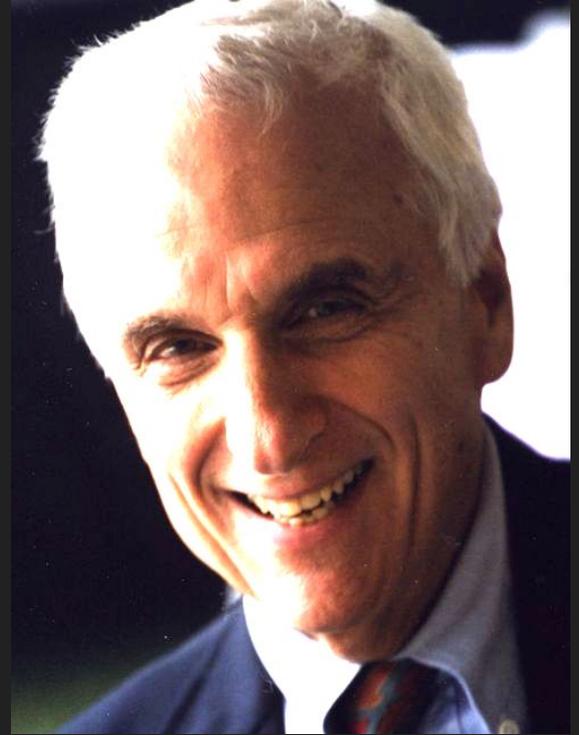
Pat Helland

Communities

"How Committees Invent"
-- Mel Conway, 1967



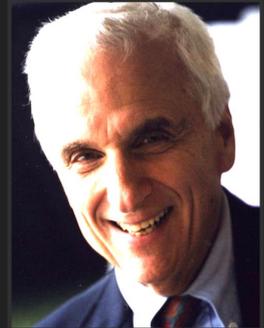
"How Committees Invent"
-- Mel Conway, 1967



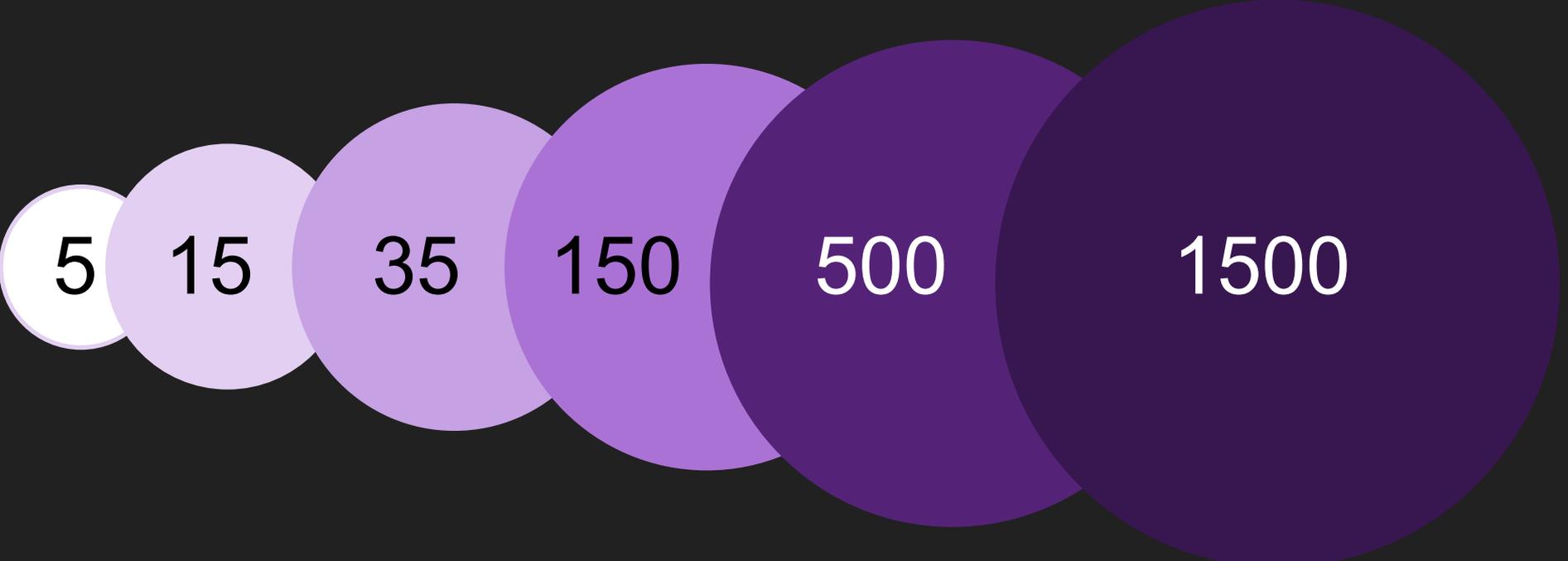
Conway's Four Laws

- Communication dictates design
- There is never enough time to do it right, but there is always enough time to do it over.
- There is a homomorphism from the linear graph of a system to the linear graph of its design organization.
- Large systems tend to disintegrate during development, qualitatively more so than with small systems.

<http://www.melconway.com/Home/pdf/committees.pdf>



Individuals



5

15

35

150

500

1500

Dunbar's Number

https://en.wikipedia.org/wiki/Dunbar%27s_number

Dunbar Groups

Intimate friends: 5

Trusted friends: 15

Close friends: 35

Casual friends: 150

-- Robin Dunbar, 1992



Kleiber's Law

Metabolic rate scales to the $3/4$ power of the animal's mass

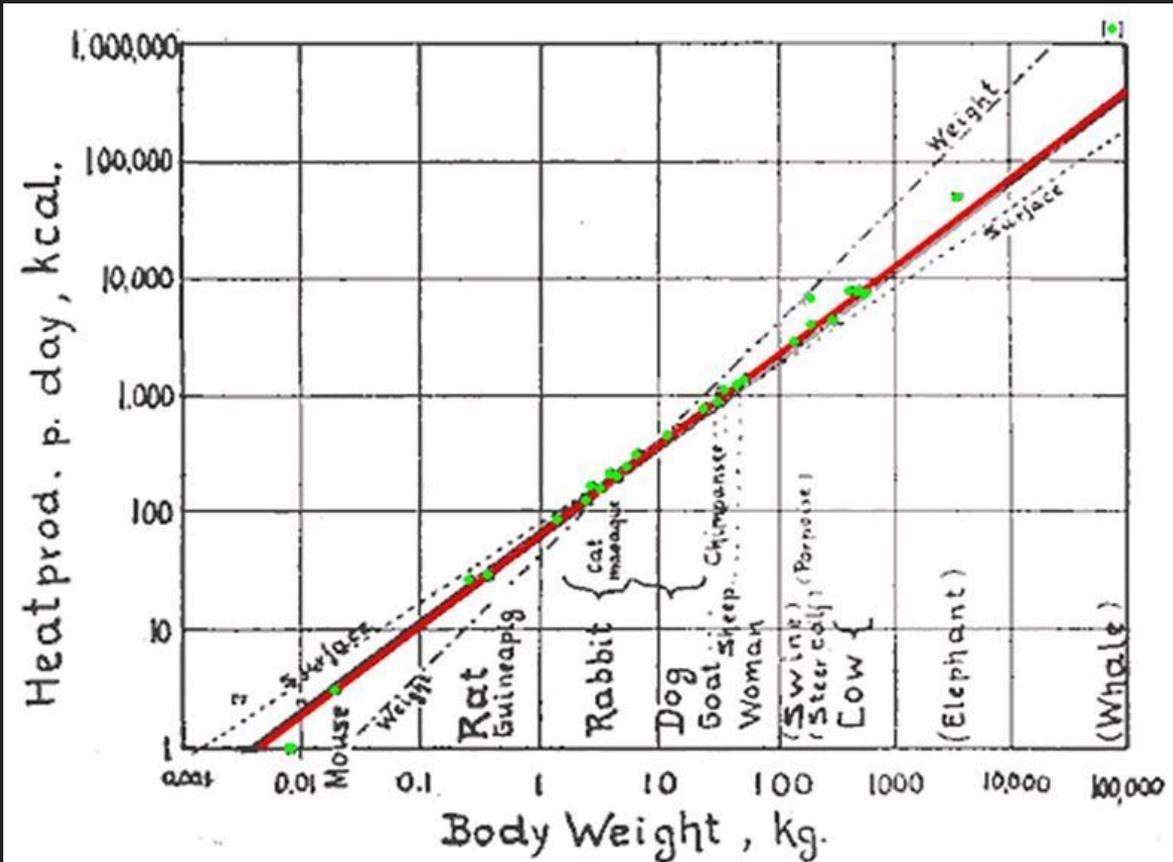
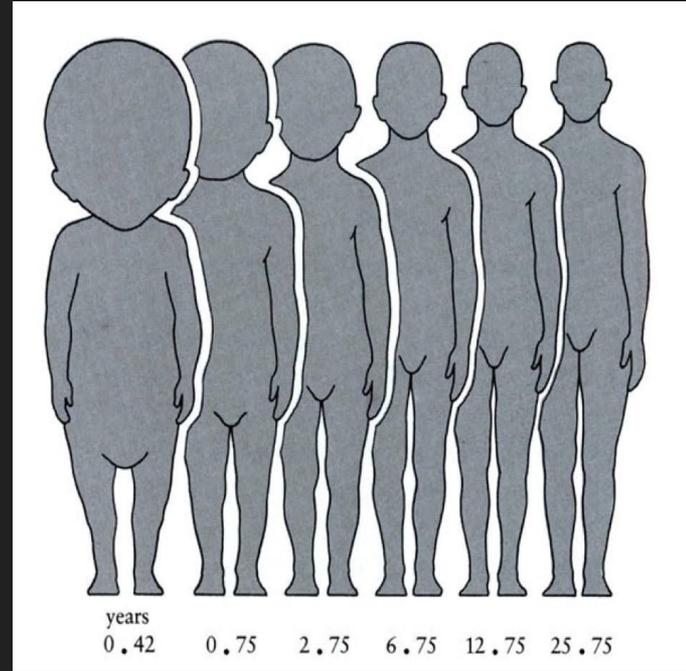


Fig. 1. Log. metabol. rate/log body weight

Allometry

"The study of the relationship of body size to shape, anatomy, physiology and finally behaviour."



Allometry

"[W]hat I am adding to the picture is the link to fragility, how fragility is necessarily tied to scale."

-- Nassim Taleb



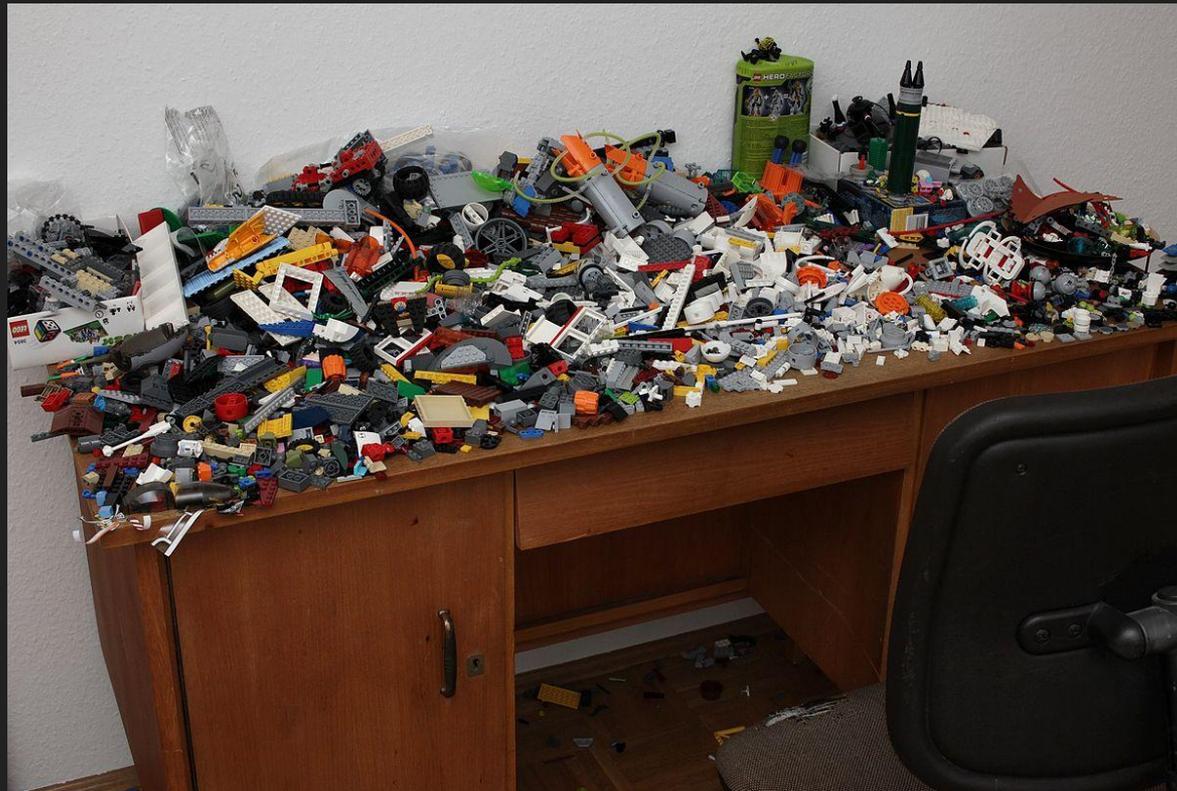
Symptoms



Symptom: Any subjective evidence of disease. In contrast, a sign is objective. Blood coming out a nostril is a sign; it is apparent to the patient, physician, and others.

Anxiety, low back pain, and **fatigue** are all symptoms; only the patient can perceive them.

Too Slow



Too Slow

"Data and services are stuck inside isolated applications within the enterprise."

-- Tung and Biltz, Accenture



Too Costly



Too Costly

"It is about renovating at the core, as opposed to getting rid of the core."

-- Hung LeHong, Gartner



Too Brittle/Unreliable

		COMPLEXITY				
		C1	C2	C3	C4	C5
SIZE	S1	100	250	400	550	700
	S2	175	325	475	625	775
	S3	250	400	550	700	850
	S4	325	475	625	775	625
	S5	400	550	700	850	1000

<https://www.infoq.com/articles/standish-chaos-2015>

Too Brittle/Unreliable

"Lower the risk of change through tools and culture."

-- John Allspaw, Etsy



Subjective

Infections



Infection: The invasion and multiplication of microorganisms such as bacteria, viruses, and parasites that are not normally present within the body. An infection may cause no symptoms and be subclinical, or it may cause symptoms and be clinically apparent. An infection may remain localized, or it may spread

meme

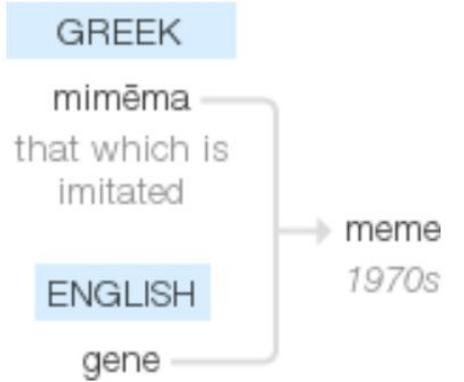
/mēm/ 

noun

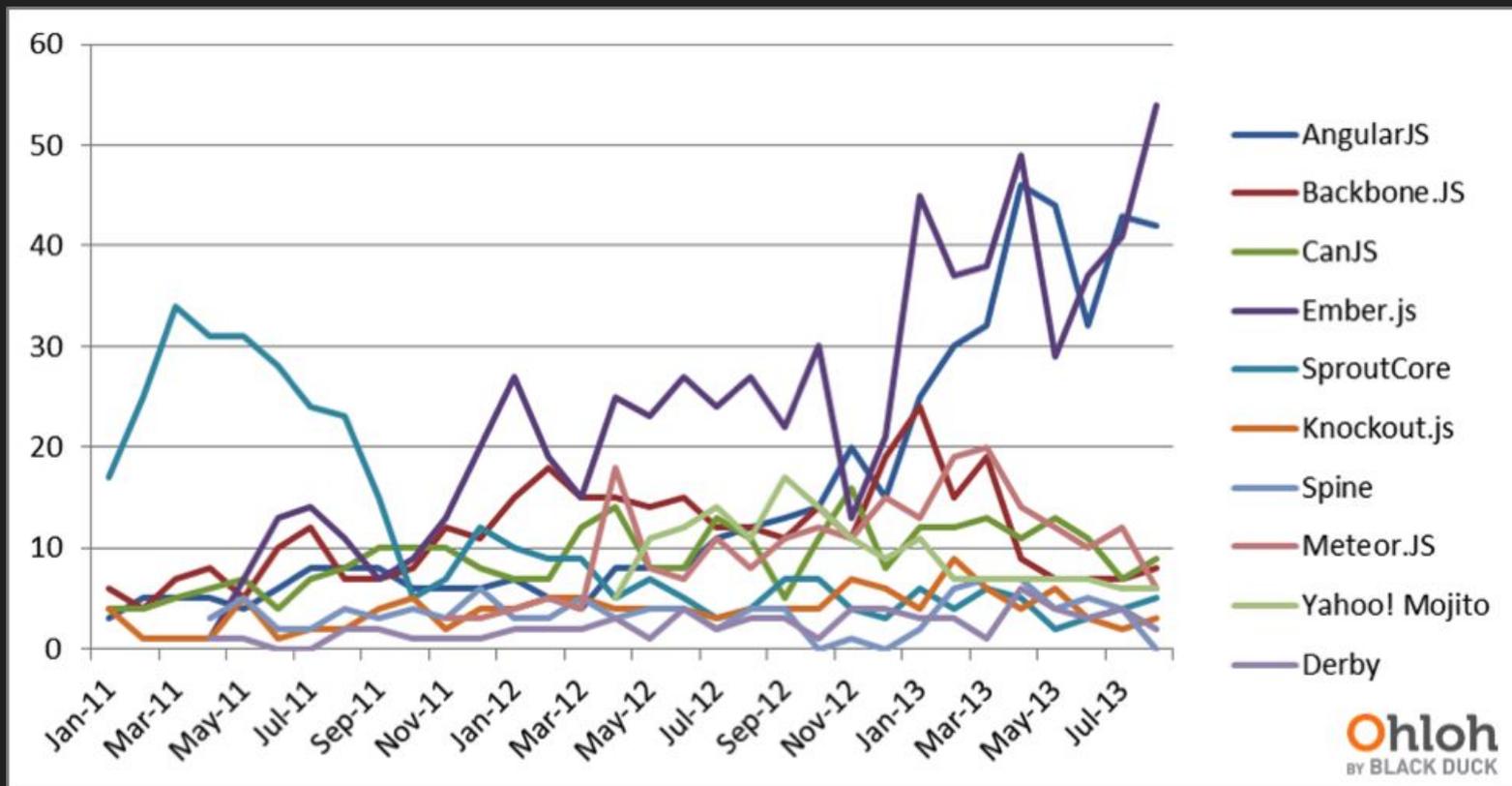
noun: **meme**; plural noun: **memes**

an element of a culture or system of behavior that may be considered to be passed from one individual to another by nongenetic means, especially imitation.

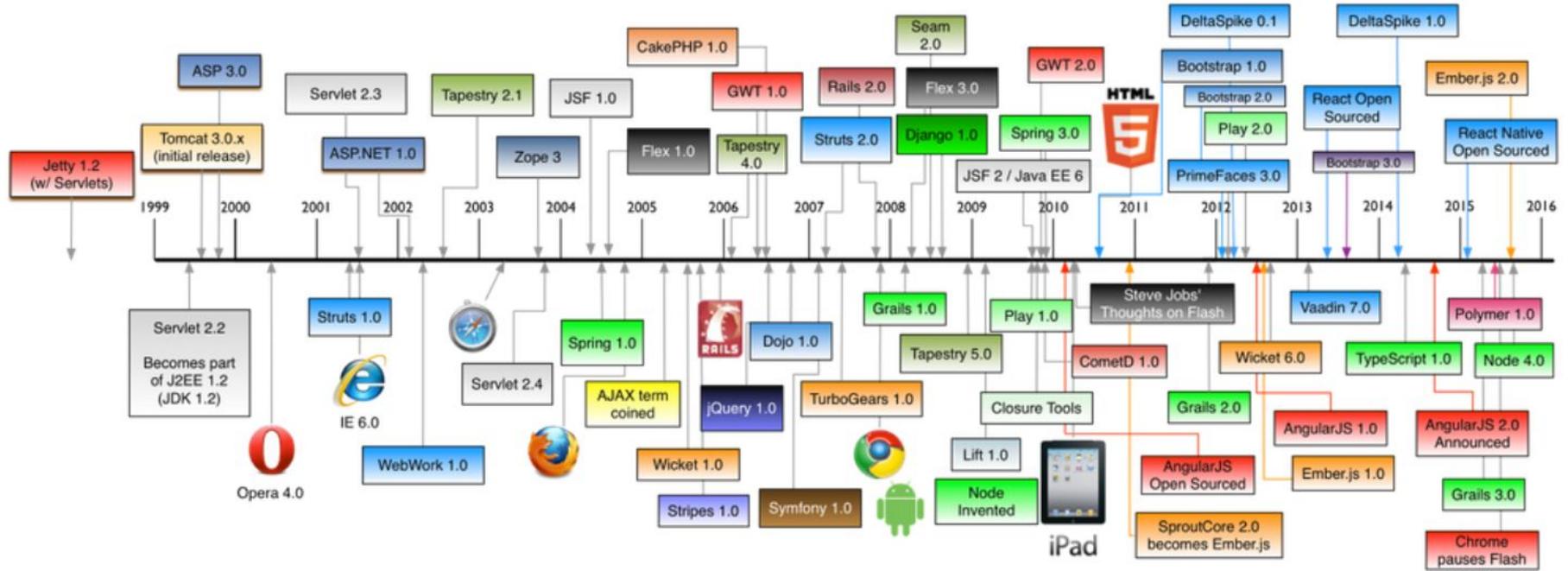
Origin



Programming Memes

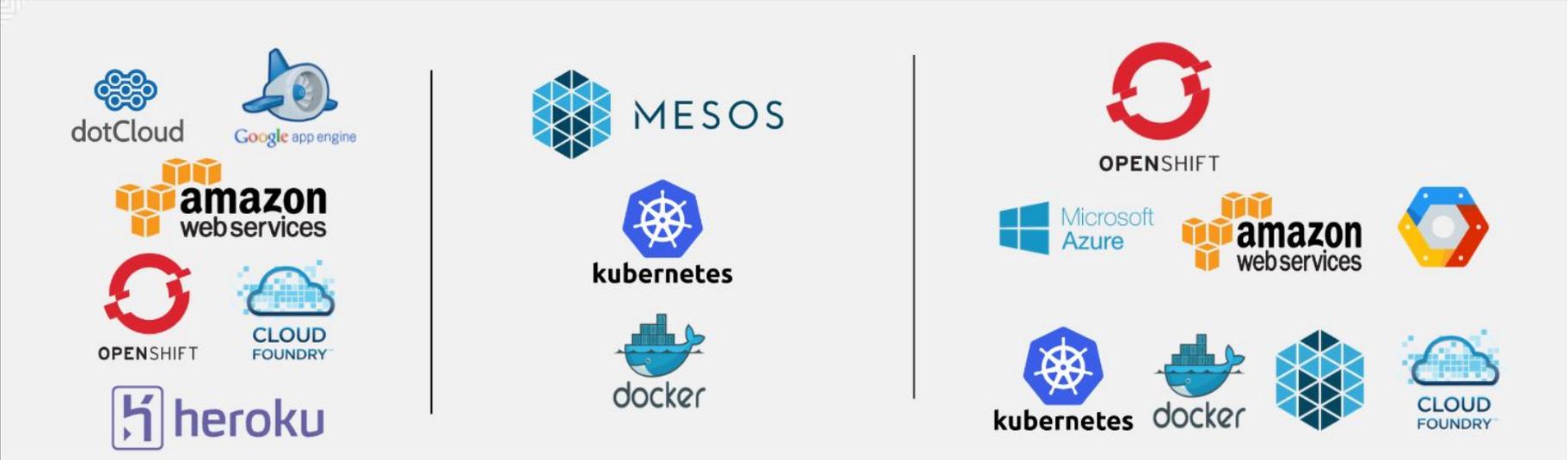


Programming Memes



Source: <https://raw.githubusercontent.com/mraible/history-of-web-frameworks-timeline/master/history-of-web-frameworks-timeline.png>

Infrastructure Memes



<https://blog.openshift.com/open-service-broker-api-platform-evolution/>

System Control Memes

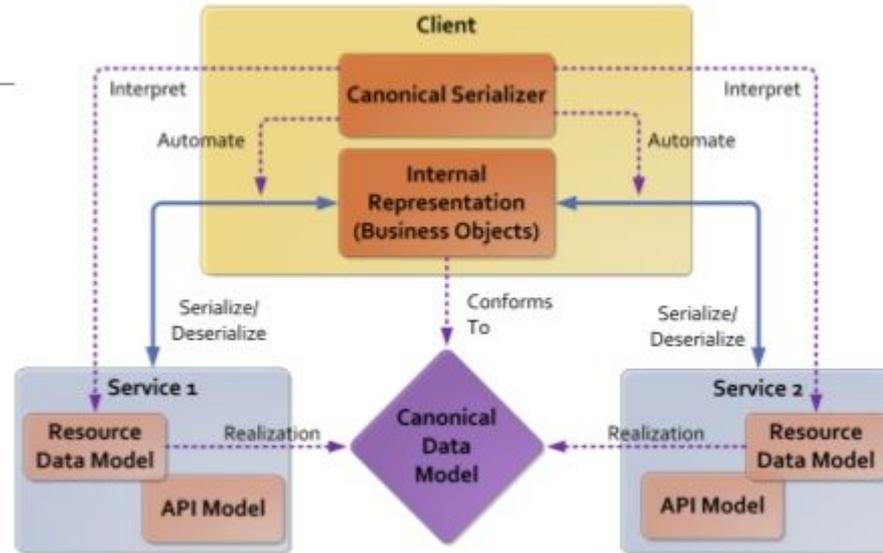
Canonical Serializer

No DTOs, no need to code transformations

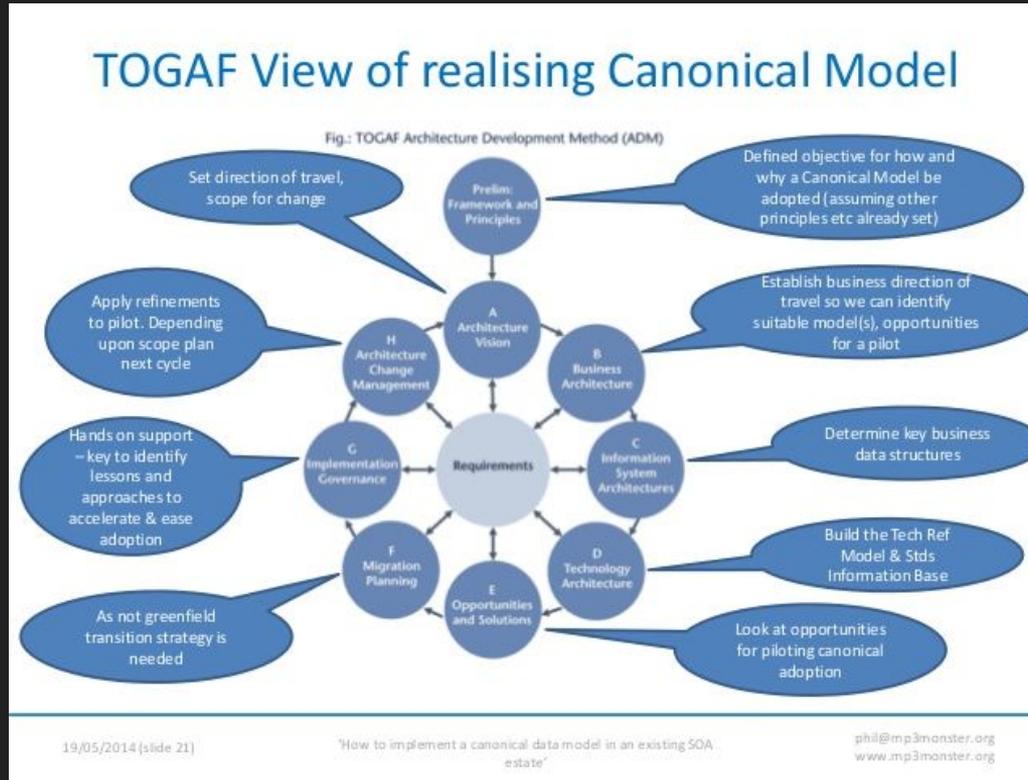
Single object graph serialized to multiple RDMs, message formats.

Canonical classes/interfaces can be used as business objects.

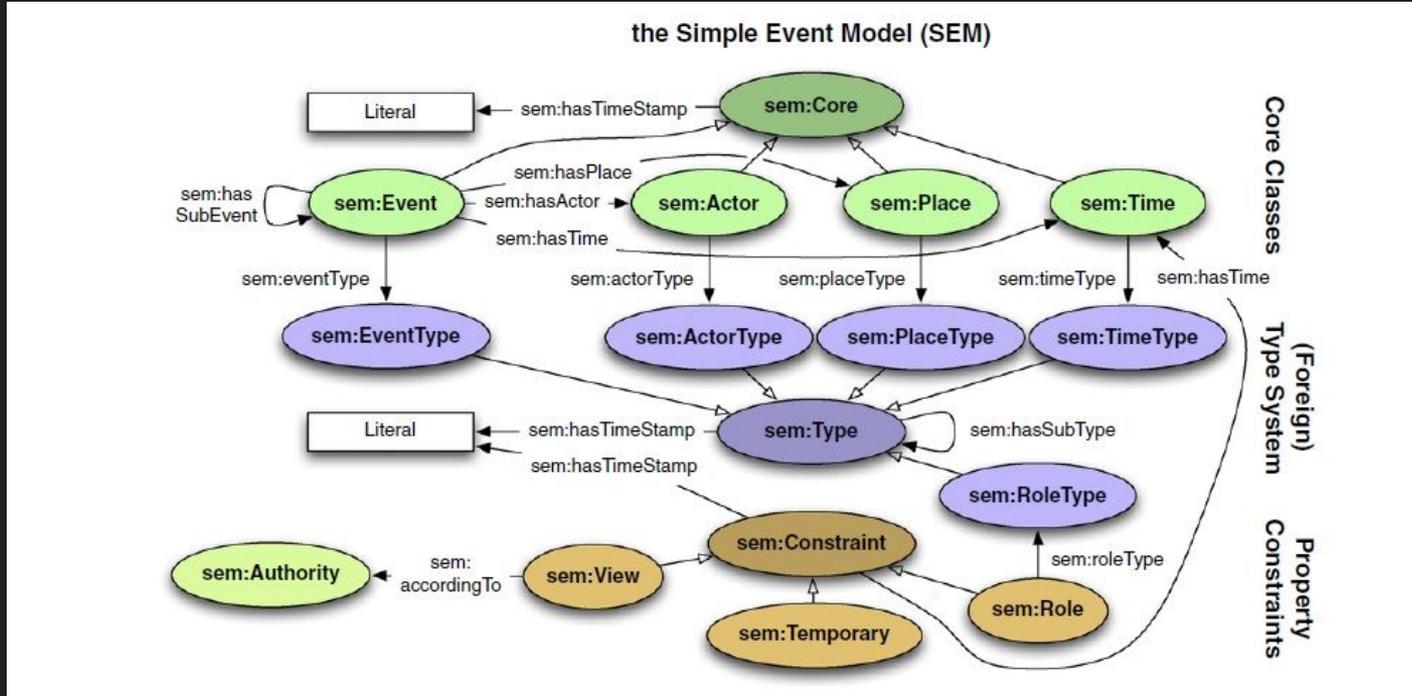
Flexibility: pluggable formats for canonical model, RDM, object graph and media type.



System Control Memes

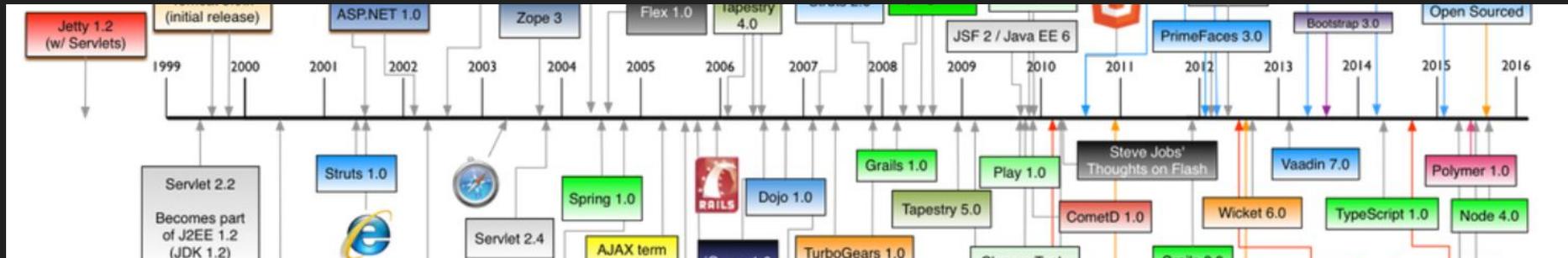


System Control Memes



Memes

- They're powerful
- They can evolve
- They may be beneficial for a time
- They may outlive their usefulness
- They may never go away



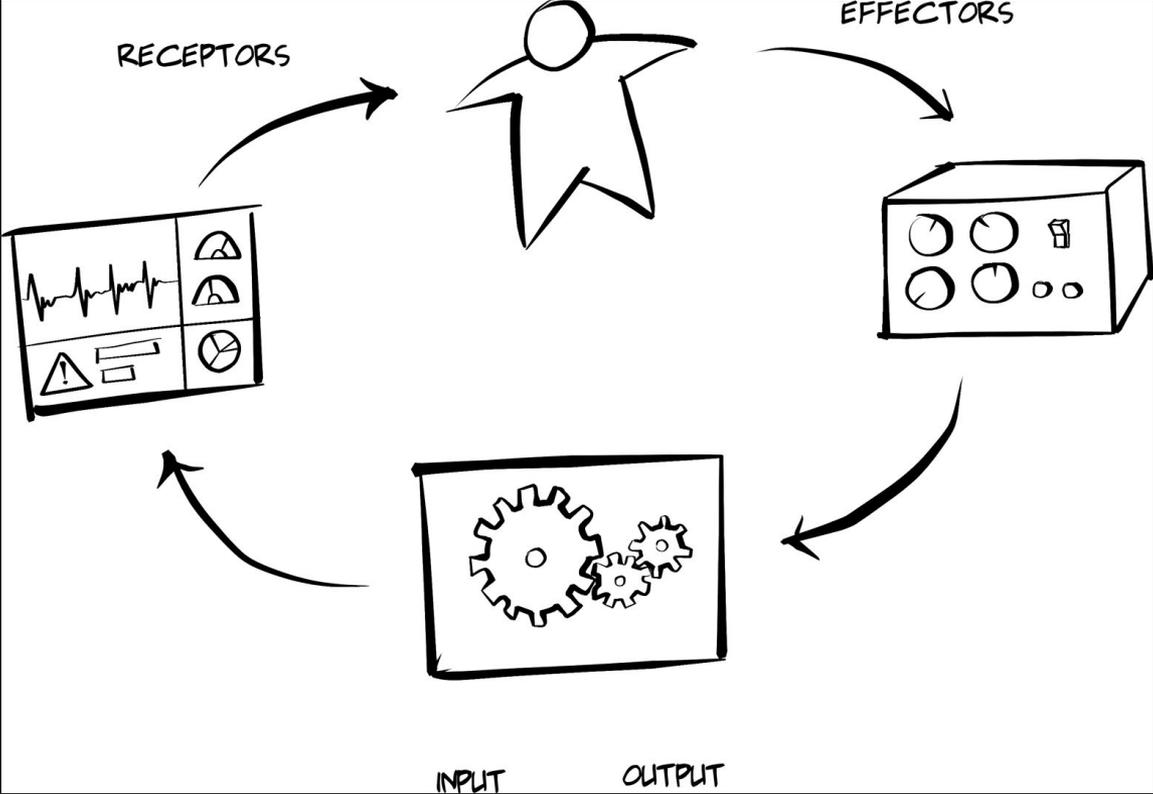
Long-Term Cures



- Cure:** 1. To heal, to make well, to restore to good health. 2. A time without recurrence of a disease so that the risk of recurrence is small.
3. Particularly in the past, a course of treatment. For example, take a cure at a spa.

The word cure comes from the Latin cura meaning care, concern or attention.

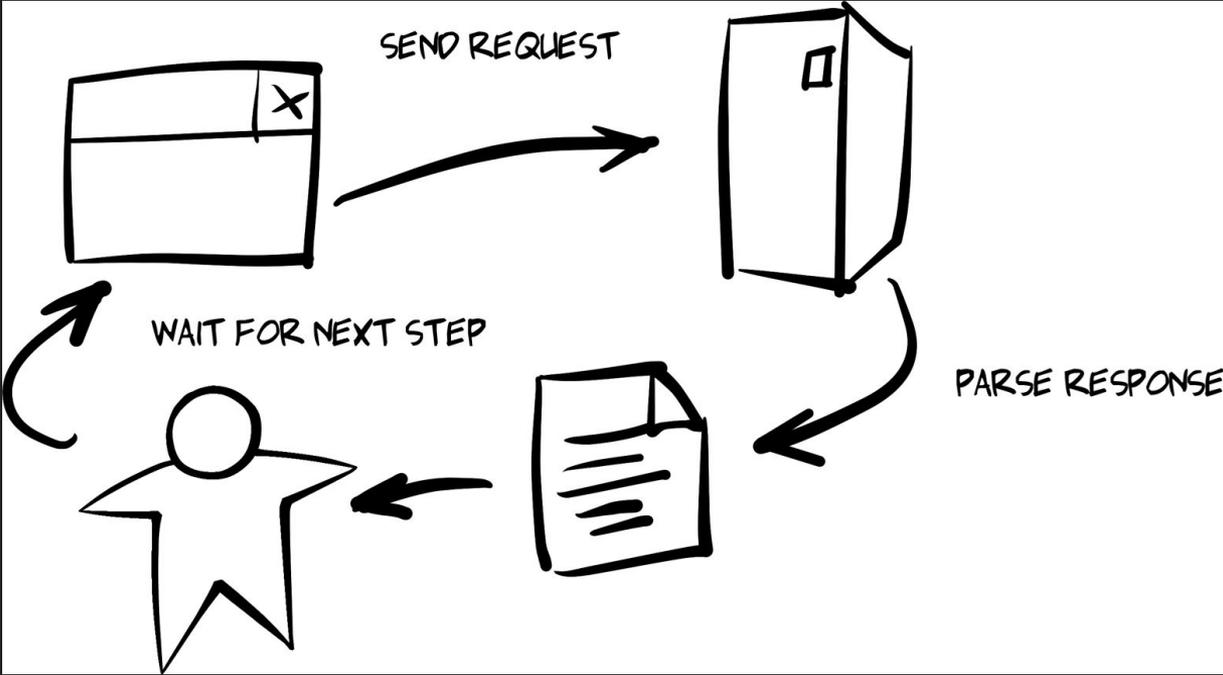
Cycles as a guide

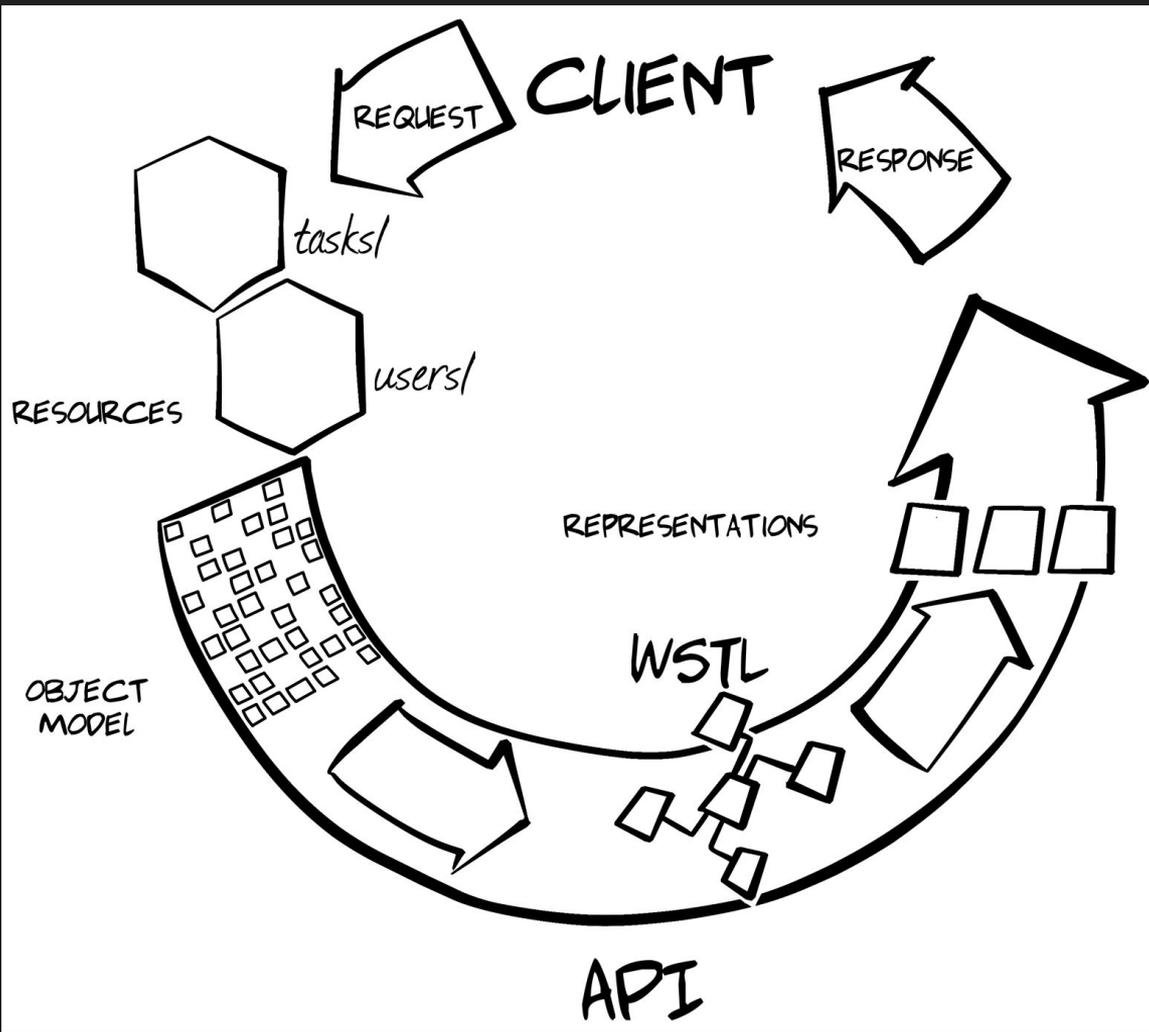


Cycles as a guide

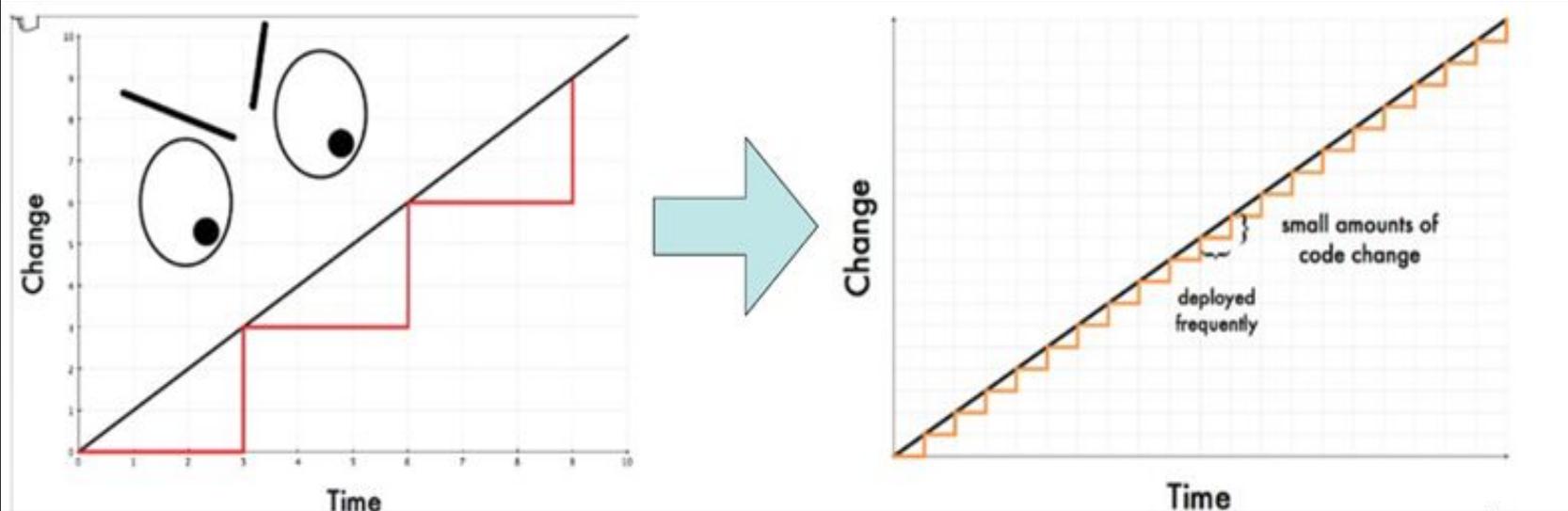


Cycles as a guide





Incremental/Validate-able



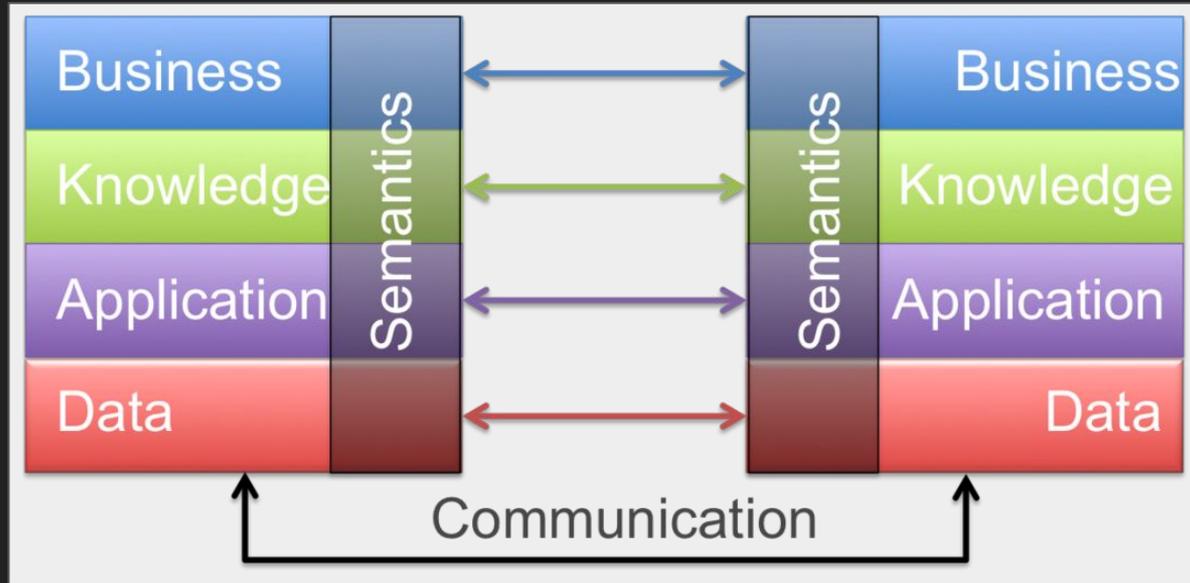
Incremental/Validate-able

*"Incremental change may just be **the next big thing** this decade."*

-- Sandeep Kishore, HCL Technologies



Eco-systems



Eco-systems

"Interoperation is peer to peer. Integration is where a system is subsumed within another."

-- Michael Platt, Microsoft



Harmonizing Speed and Safety at Scale



Harmonizing Speed and Safety at Scale



Harmonizing Speed and Safety at Scale

So...



Symptoms



Symptoms

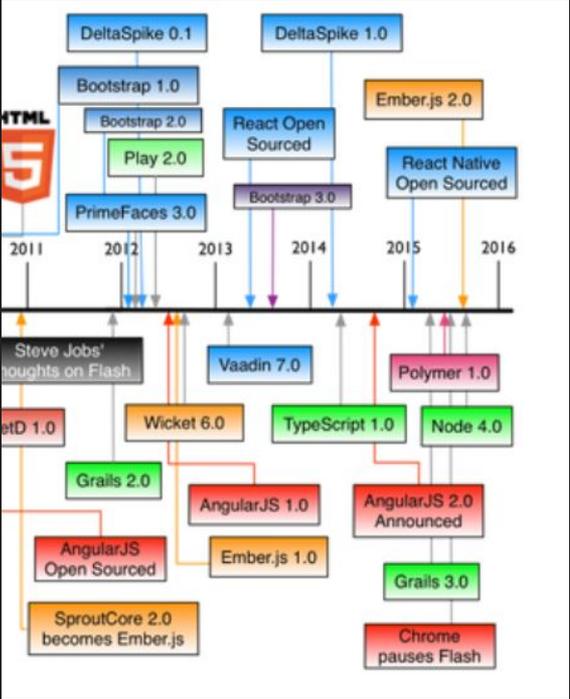


Symptoms

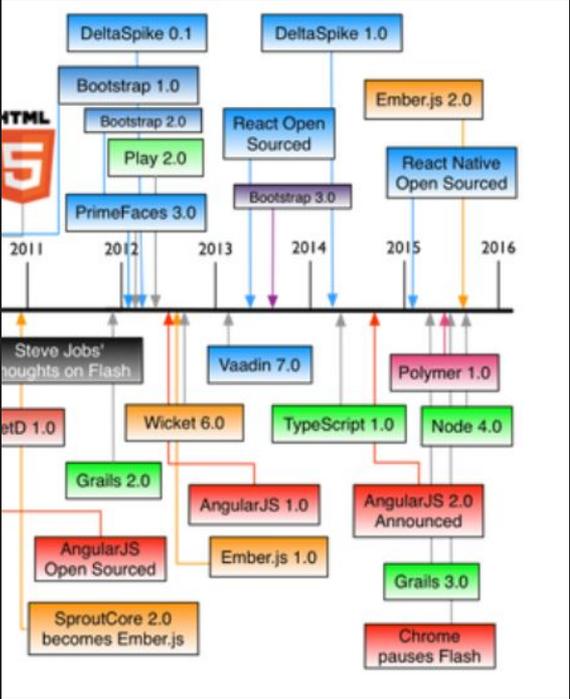


COMPLEXITY				
	C2	C3	C4	
0	250	400	550	700
5	325	475	625	775
0	400	550	700	850
5	475	625	775	850
0	550	700	850	1000

Memes



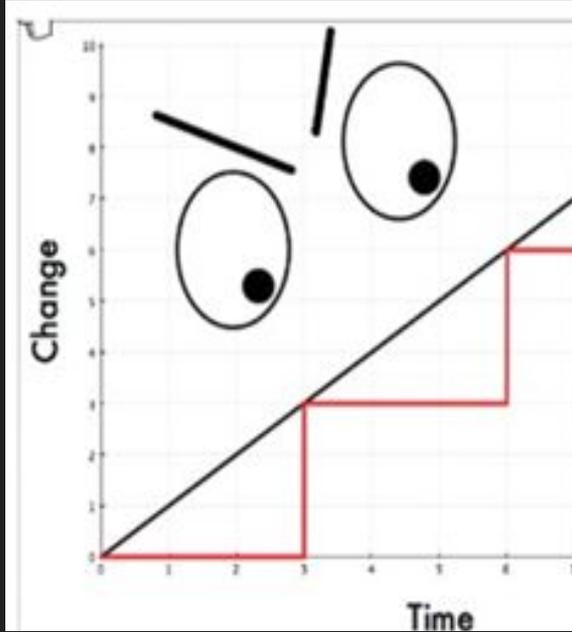
Memes



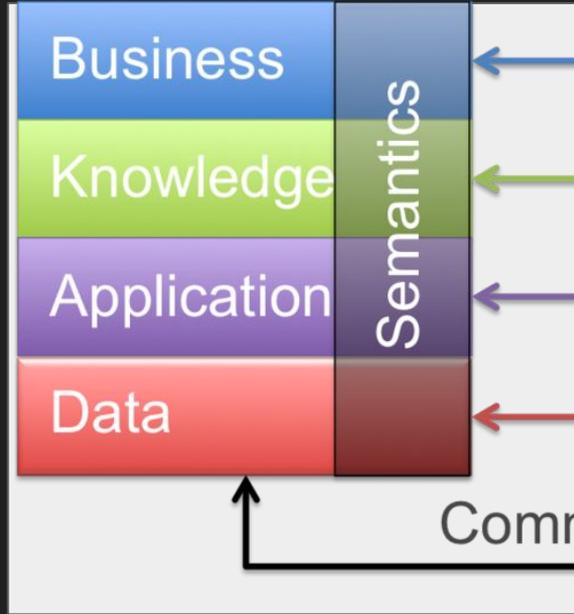
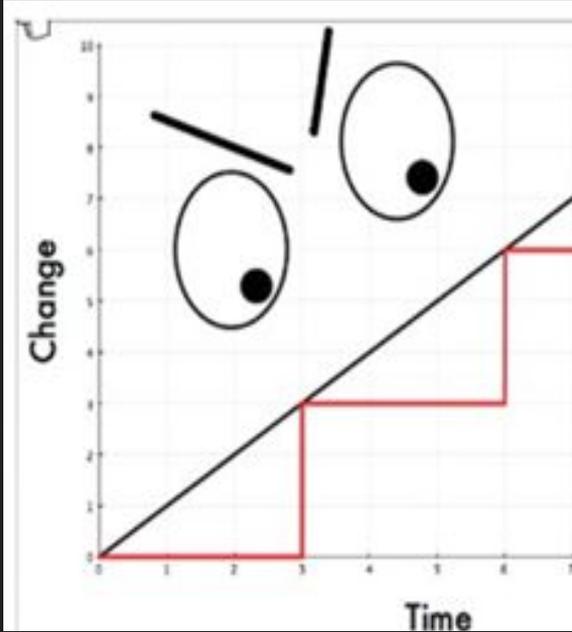
Memes



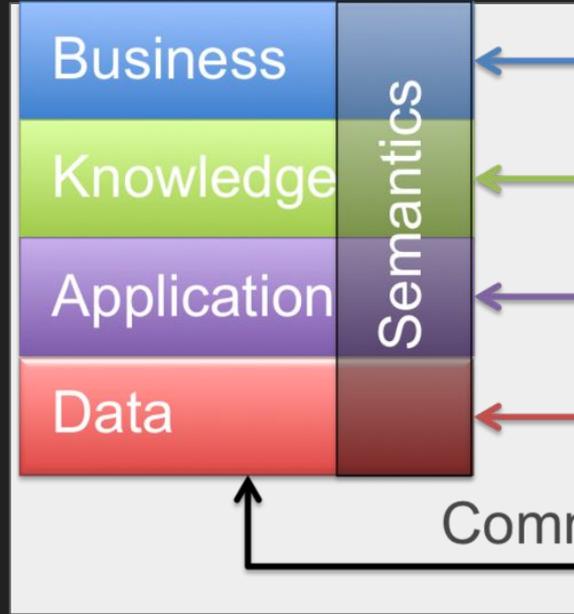
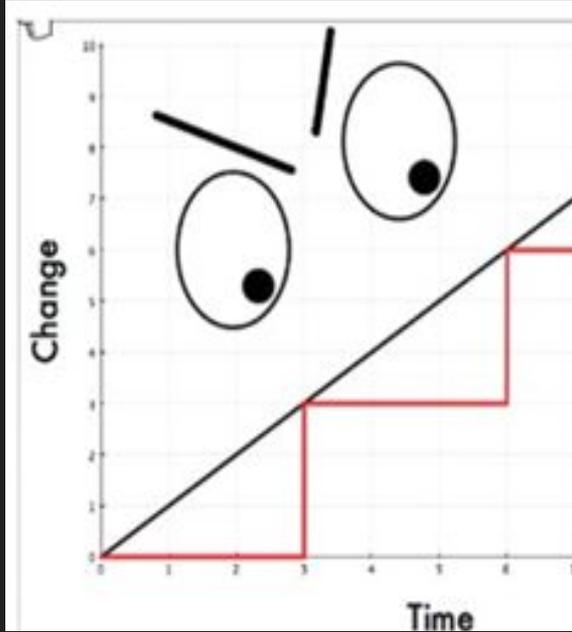
Long-Term



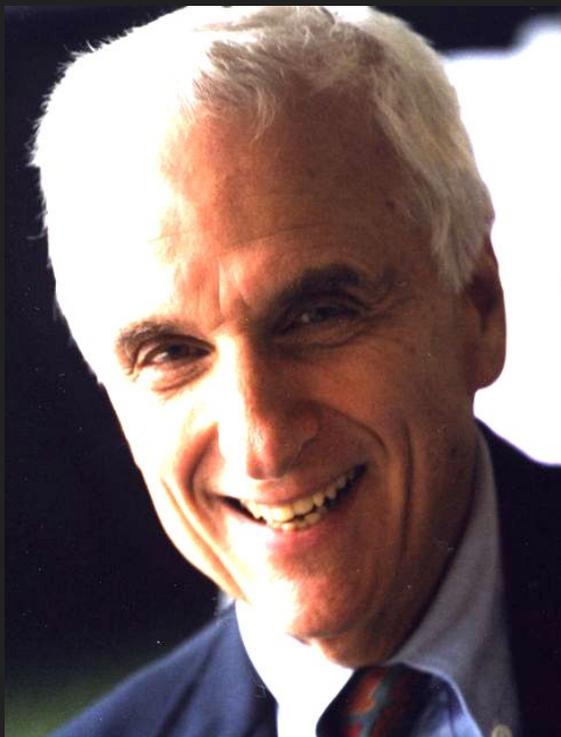
Long-Term



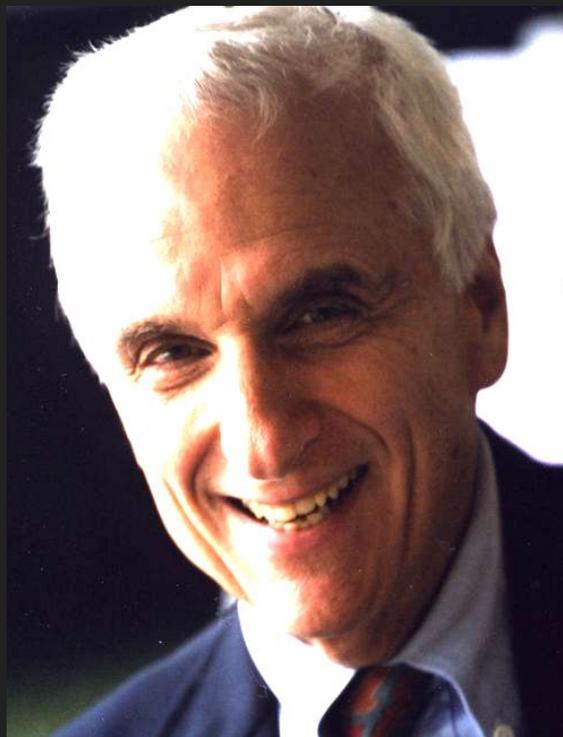
Long-Term



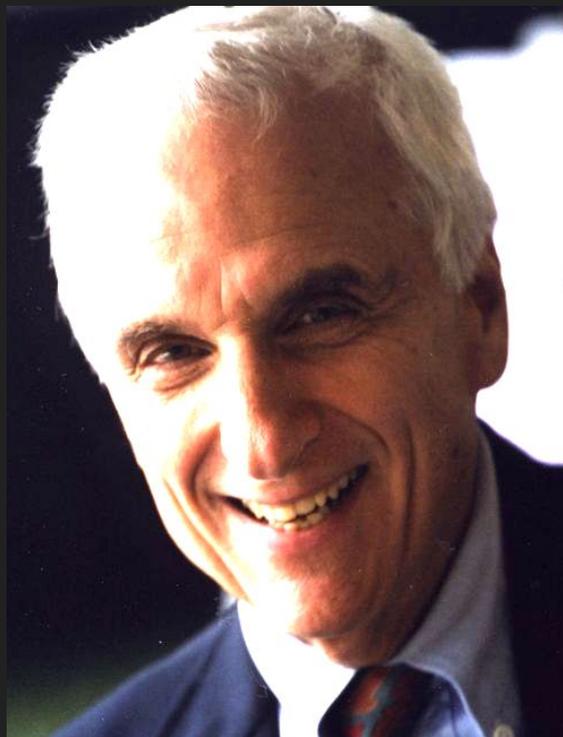
Scaling



Scaling



Scaling



*"The best way to
predict the future
is to invent it."*

-- Alan Kay



"The
pre

ay to
the
inve

Man Kay



*"The best software
architecture 'knows' what
changes often and makes that
easy."*

*-- Paul Clements
Carnegie-Mellon*



A wide-angle landscape photograph showing a dense forest of tall, green pine trees in the foreground and middle ground. The trees are mostly conifers, with some bare branches visible. In the distance, a valley or plain is visible, with a few buildings and more trees. The sky is a clear, pale blue. The word "Questions" is written in a large, white, sans-serif font, centered horizontally and slightly above the middle vertically, overlaid on the forest scene.

Questions



Scaling the Future

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