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Rachel Laycock @rachellaycock



The Anti-Pattern of the Future?

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MICRO-SERVICES

The Anti-Pattern of the Future?



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WTF?

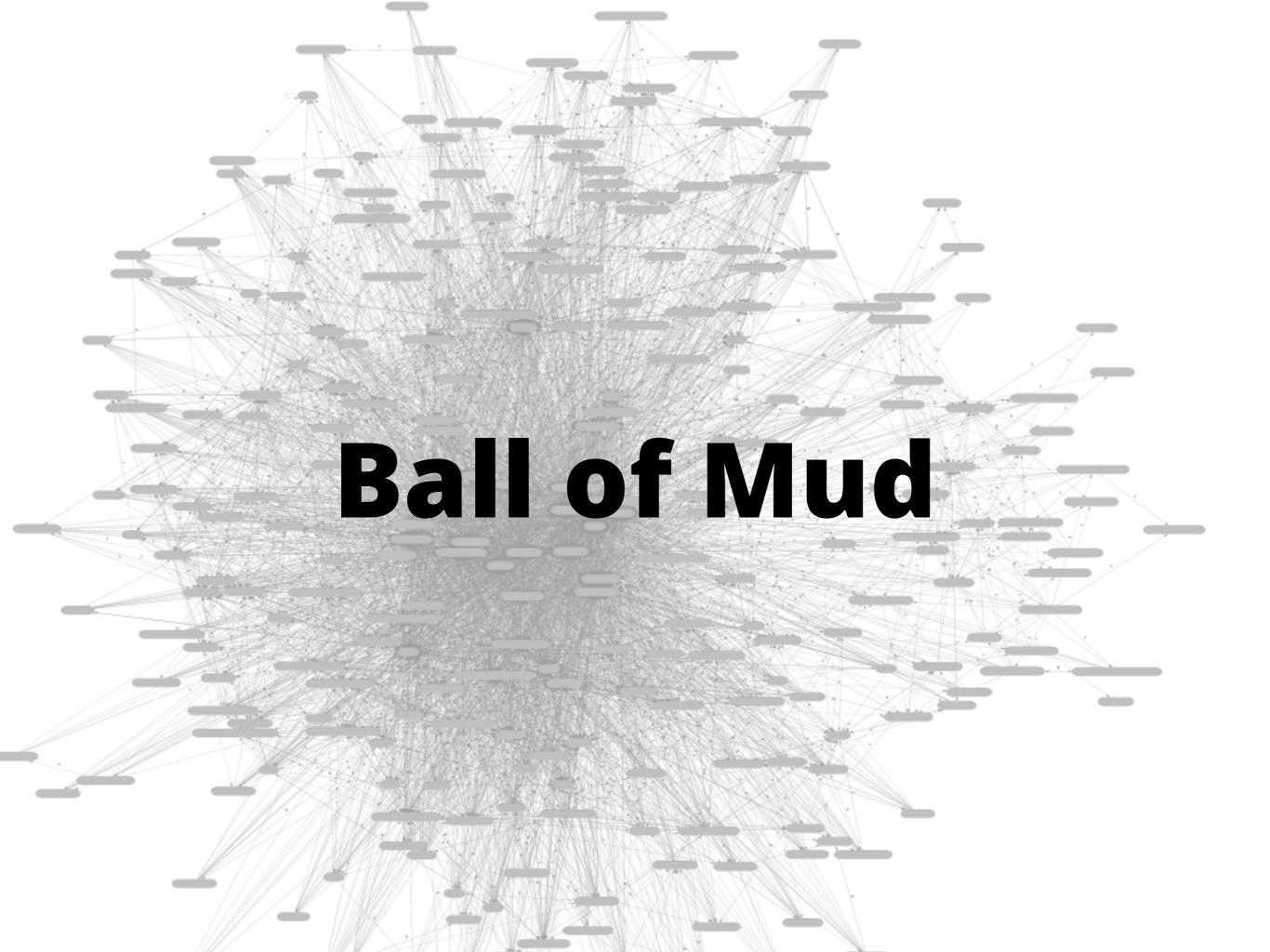
□ What are micro-services?

□ Why do we want them? Or maybe not..

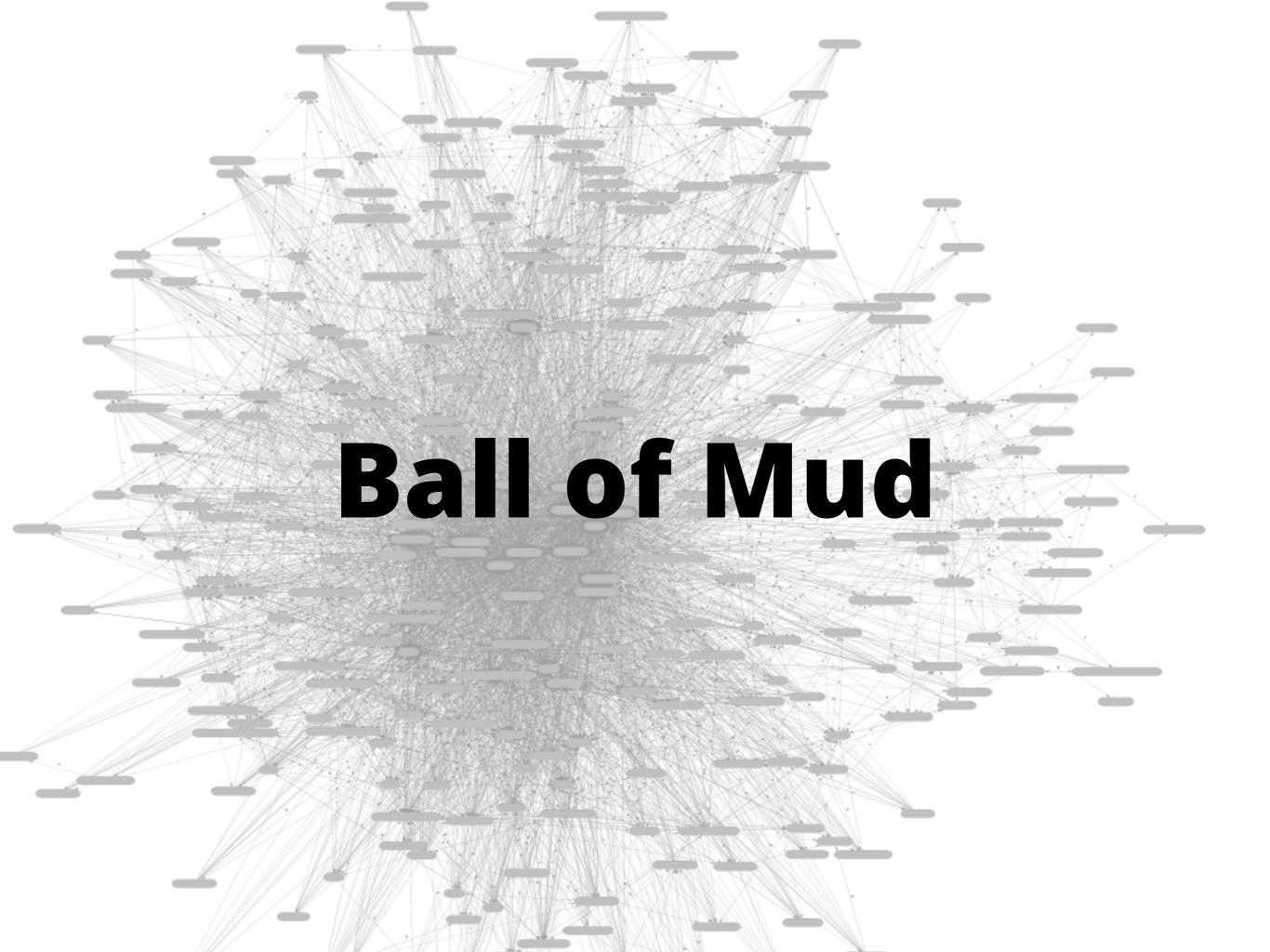
□ What are the key challenges?

□ Are they the anti pattern of the future?

but first...

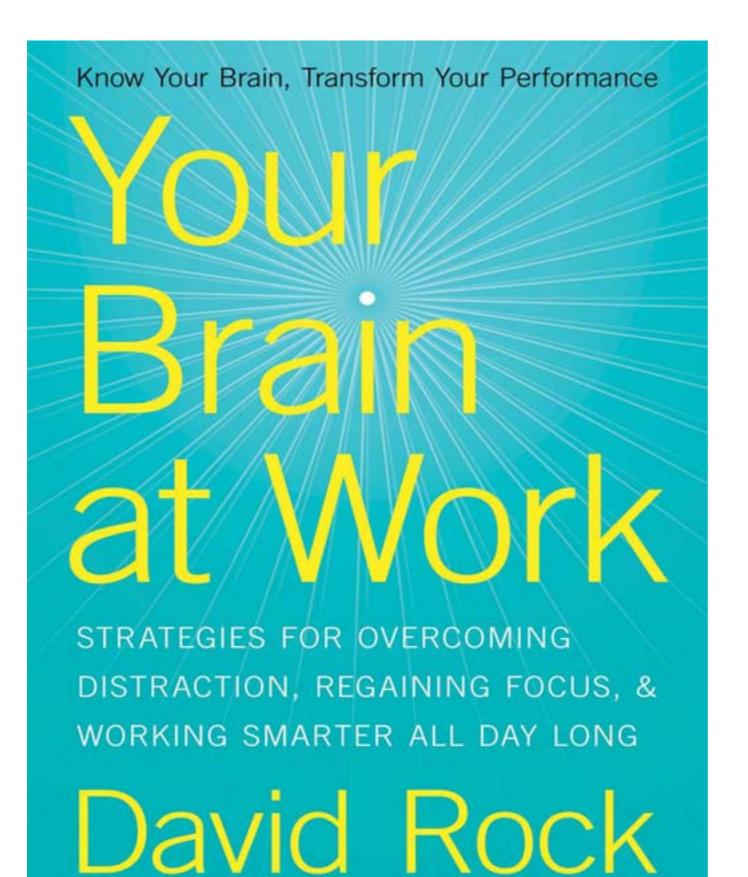


"expediency **over** design" - Brian Foot & Joseph Yoder









Your Brain at Work

Foreword by Daniel J. Siegel, M.D.

□ What are micro-services?

□ Why do we want them? Or maybe not..

□ What are the key challenges?

□ Are they the anti pattern of the future?

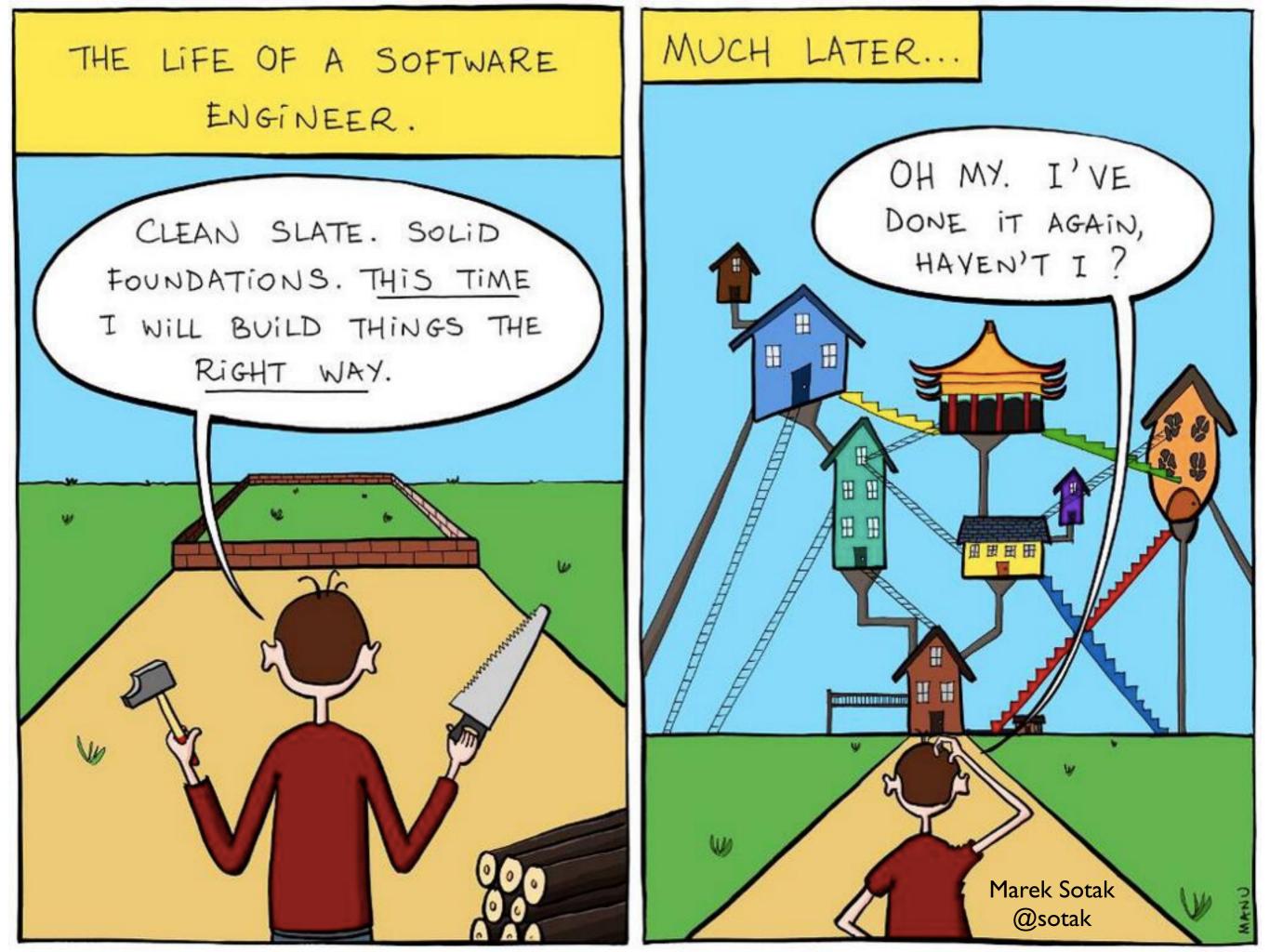
MICRO-SERVICES

What are micro-services?

□ Why do we want them? Or maybe not..

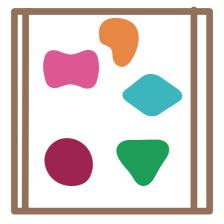
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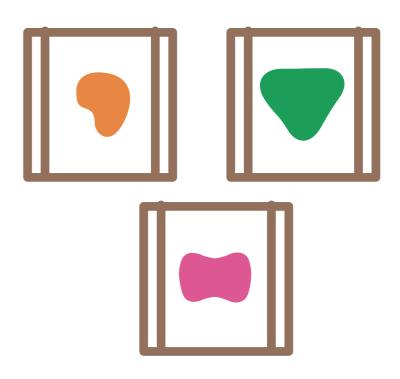


SIMPLE AND LIGHTWEIGHT

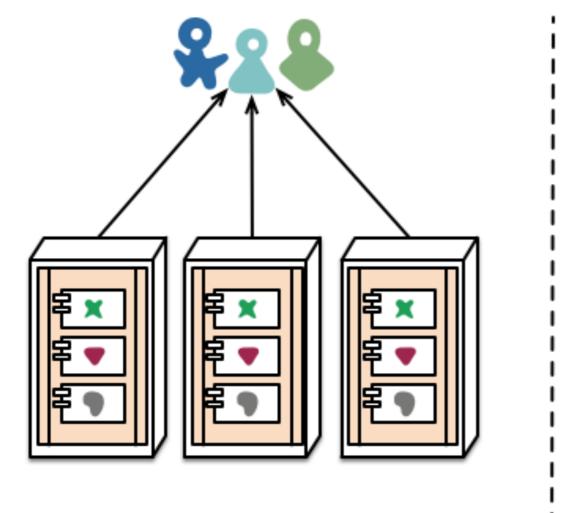
A monolithic application puts all its functionality into a single process...



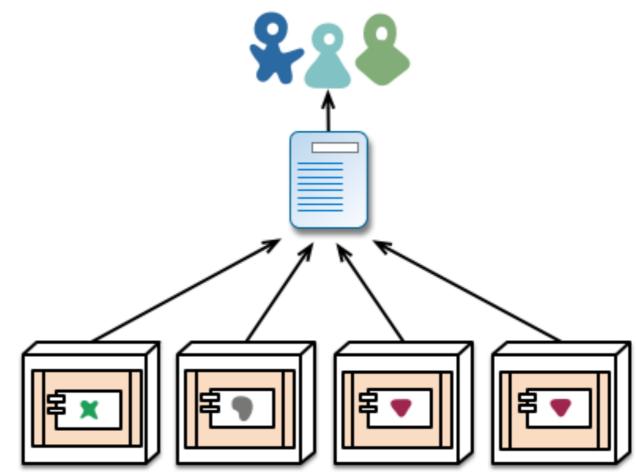
A microservices architecture puts each element of functionality into a separate service...



INDEPENDENT PROCESSES

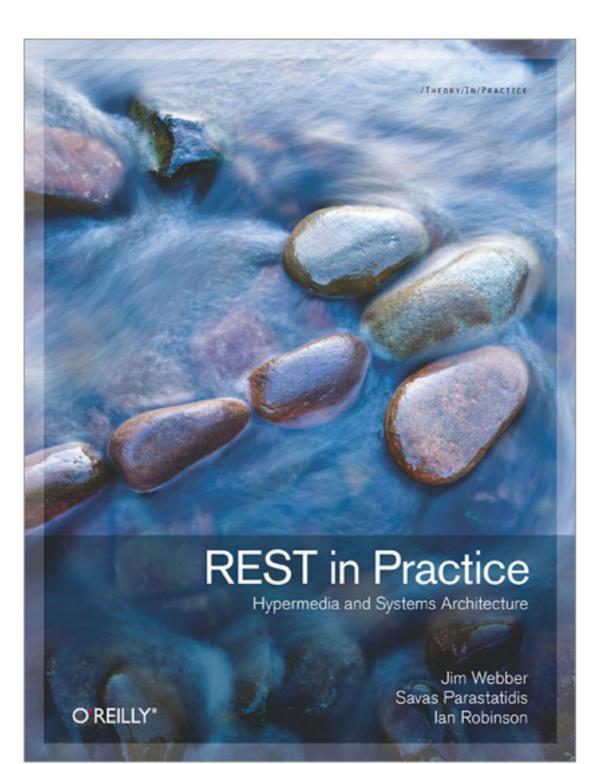


monolith - multiple modules in the same process



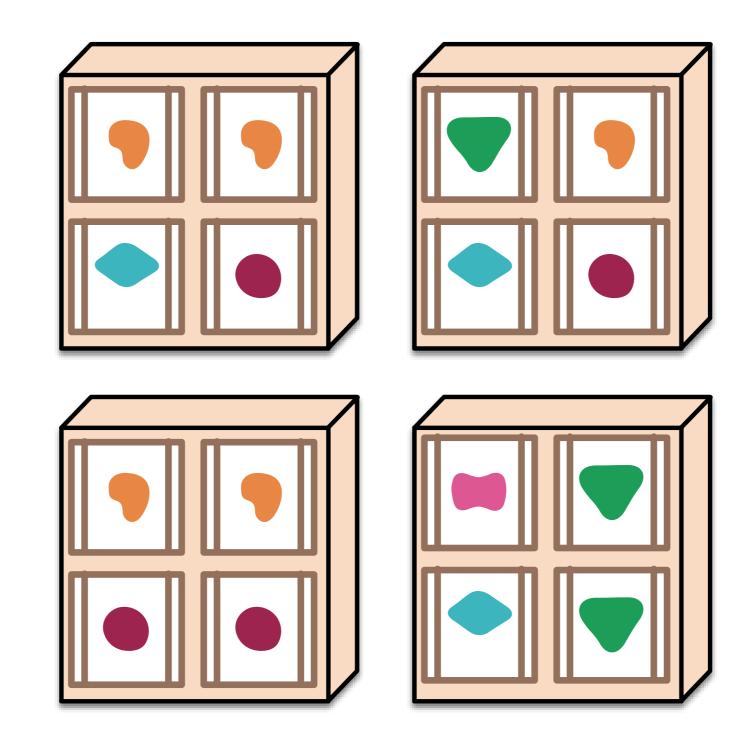
microservices - modules running in different processes

LANGUAGE AGNOSTIC APIS



"be of the web"

DECOUPLED



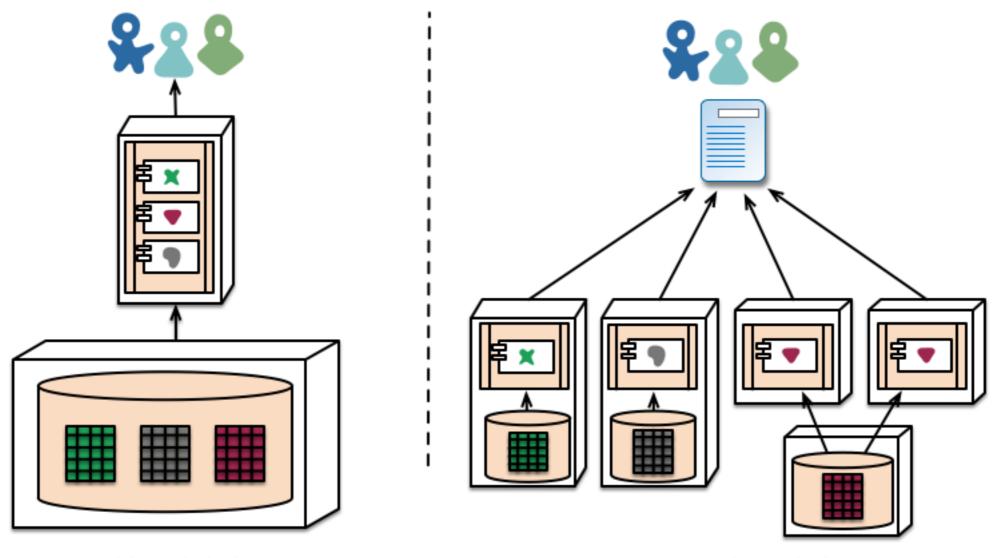
□ What are micro-services?

□ Why do we want them? Or maybe not..

□ What are the key challenges?

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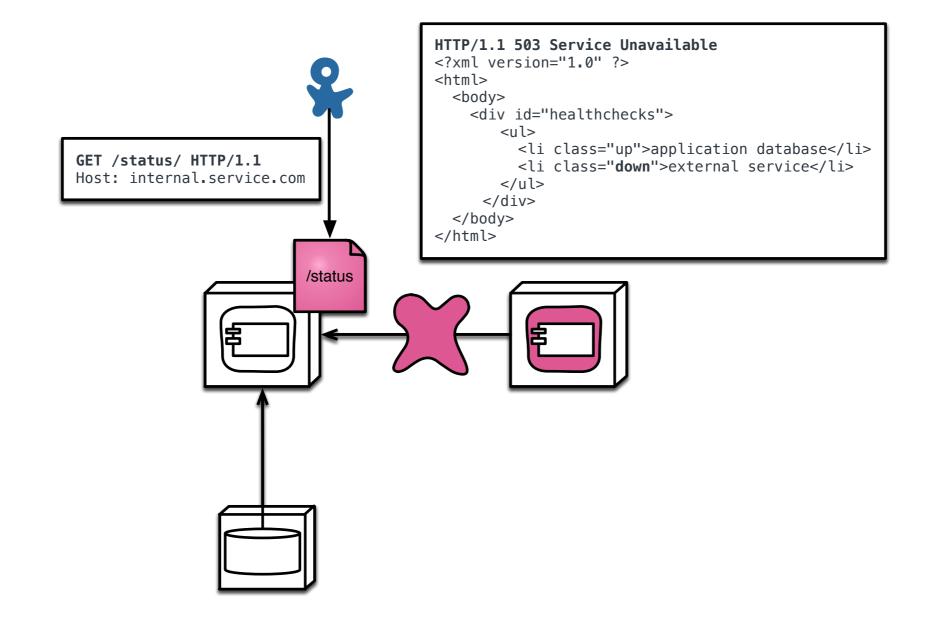
The right tool for the job



microservices - application databases

monolith - single database

RESILIENCE

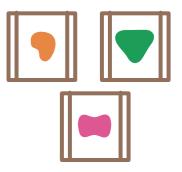


SCALING

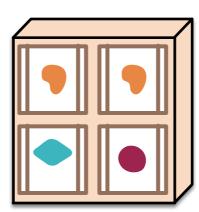
A monolithic application puts all its functionality into a single process...

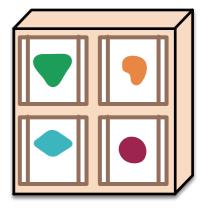


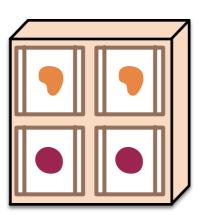
A microservices architecture puts each element of functionality into a separate service...

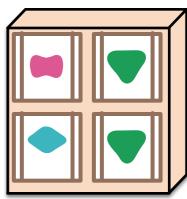


... and scales by distributing these services across servers, replicating as needed.

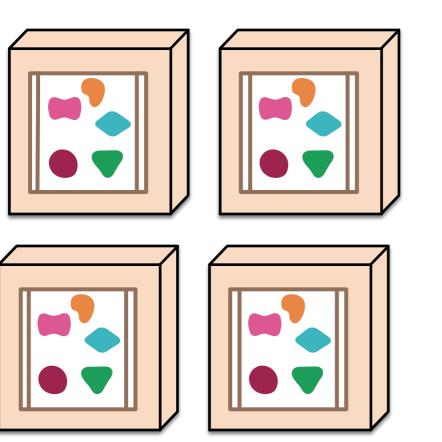




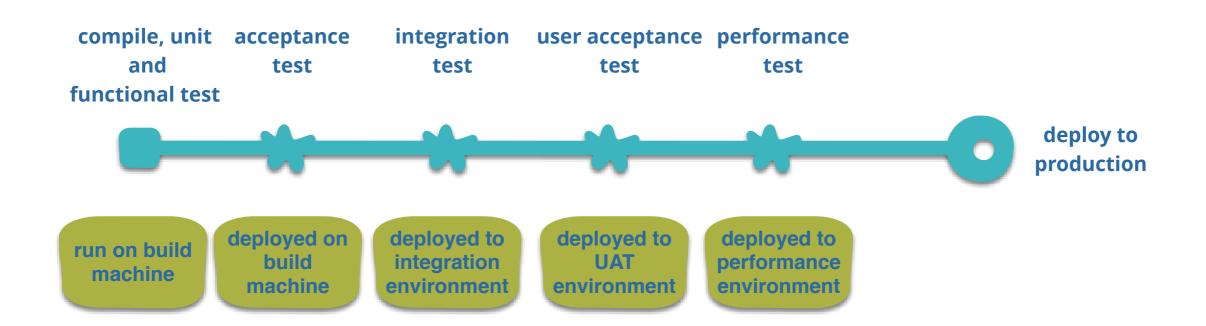




... and scales by replicating the monolith on multiple servers



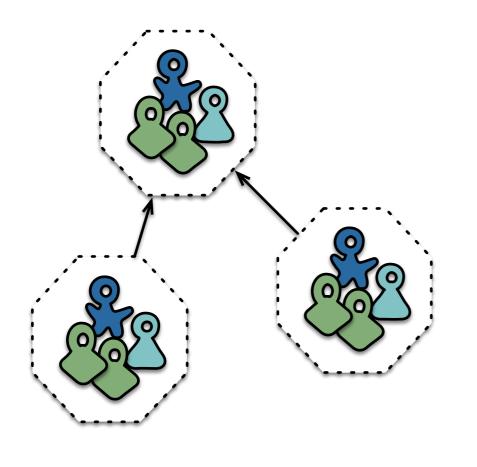
DEPLOYMENT

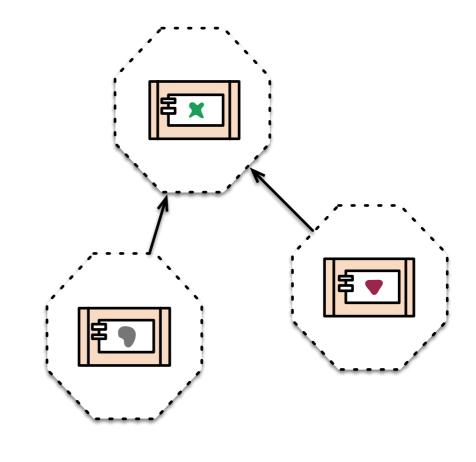


Conway's law

"organisations which design systems ... are constrained to designs which are copies of the communication structures of these organisations"

Conway's law



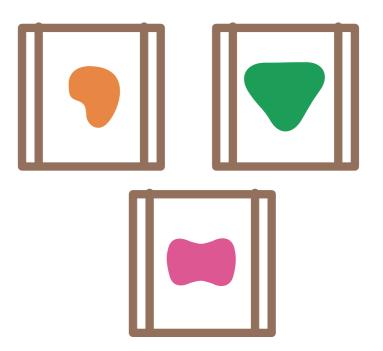


Cross-functional teams...

... organised around capabilities Because Conway's Law

REPLACEABLE SERVICES

A microservices architecture puts each element of functionality into a separate service...

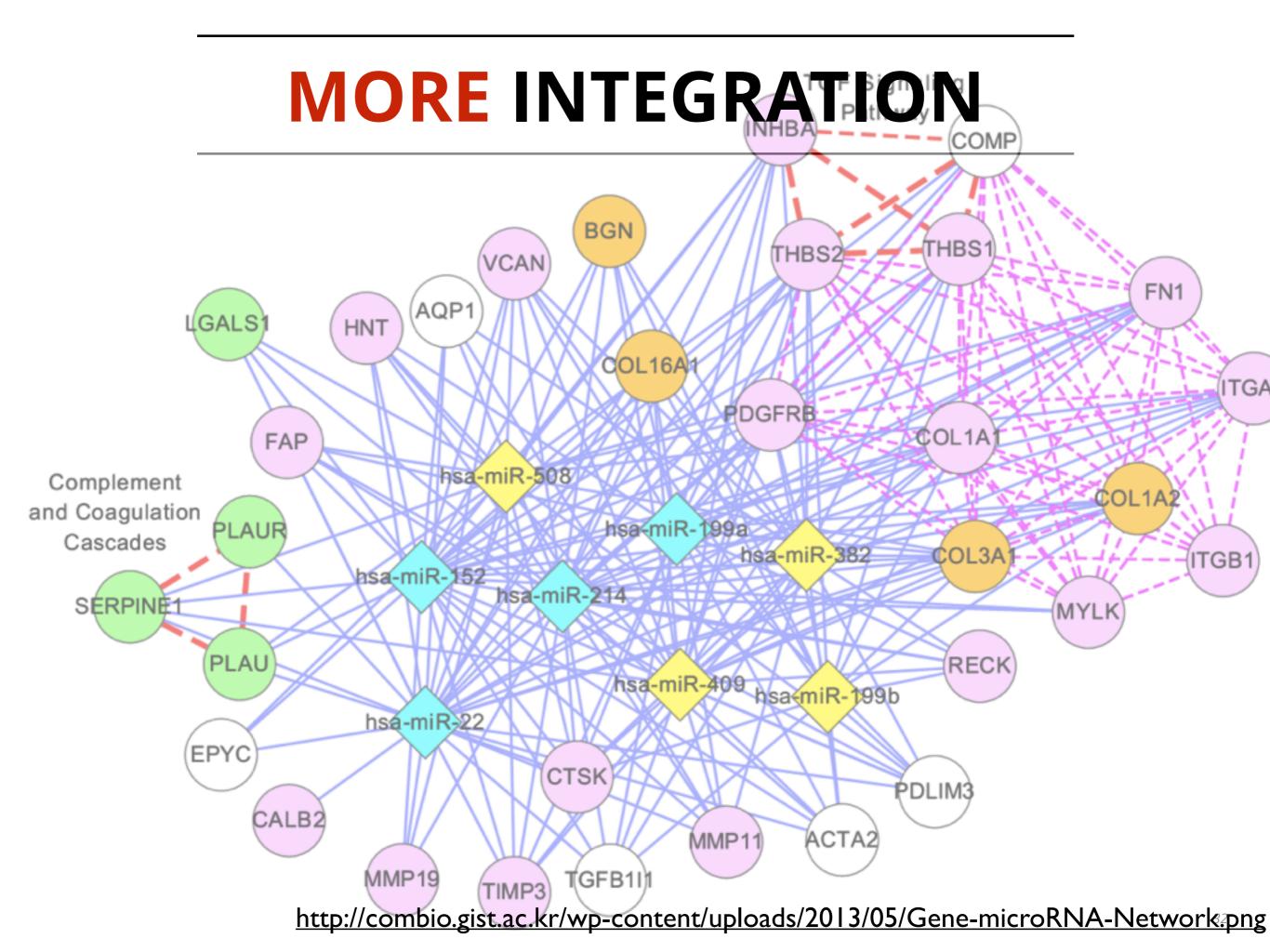


Preparing for the unknown



"With great power..."





MONITORING AND TESTING

Home Disc		https://monitor.tag1co	onsulting.com/nagio	s/			○ ^ Q ₇ (Google
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www.tag1consulting.com Mysgl Buffer Waits OK 02-03-2009 00:20:48 0d 3h 38m 3s 1/3 OK - 0 Innodb buffer pool waits in 299 seconds (0.0000/sec) process Info erformance Info cheduling Queue Mysgl Connect Time OK 02-03-2009 00:21:17 7d 11h 30m 24s 1/3 OK - Connection Time 0.109 seconds hysgl ISAM Cache OK 02-03-2009 00:21:12 2d 1h 57m 51s 1/3 OK - O Innodb log write requests waiting 300 seconds (0.0000/sec) porting Mysgl ISAM Cache OK 02-03-2009 00:22:01 0d 3h 41m 43s 1/3 OK - O Innodb log write requests waiting 300 seconds (0.0000/sec) wailability Mysgl Isave Lag OK 02-03-2009 00:22:00 0d 3h 41m 43s 1/3 OK - Innodb Buffer Pool Hitrate at 100.00% Nysgl InnoDb Hit Rate OK 02-03-2009 00:17:00 2dd 1h 55m 16s 1/3 OK - Innodb Buffer Pool Hitrate at 100.00% wailability Mysgl Isave Lag OK 02-03-2009 00:18:00 0d 3h 41m 43s 1/3 OK - Contention at 0.00% Wesgl Table Locks OK 02-03-2009 00:18:00 0d 3h 41m 43s 1/3 OK - Table lock Contention at 0.00% Wesgl Table Locks OK 02-03-2009 00:18:07 0d 3h 65m 6s 1/3 <td>-</td> <td></td> <td>PING</td> <td>ок</td> <td>02-03-2009 00:20:19</td> <td>21d 5h 22m 18s</td> <td>1/3</td> <td></td>	-		PING	ок	02-03-2009 00:20:19	21d 5h 22m 18s	1/3	
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cheduling Queue Mysgl ISAM Cache OK 02-03-2009 00:21:32 24d 1h 57m 51s 1/3 1/3 000 with they obting hinded at 100.00% porting Mysgl InnoDB Log OK 02-03-2009 00:22:01 0d 3h 41m 43s 1/3 0K - 0 Innodb log write requests waiting 300 seconds (0.0000/sec) rends Mysgl InnoDb Hk Rate OK 02-03-2009 00:17:30 24d 1h 55m 16s 1/3 OK - Innodb log write requests waiting 300 seconds (0.0000/sec) vallability Mysgl Slave Lag OK 02-03-2009 00:18:00 0d 3h 41m 43s 1/3 OK - Innodb Buffer Pool Hitrate at 100.00% lert Histogram Mysgl Table Locks OK 02-03-2009 00:18:00 0d 3h 41m 43s 1/3 OK - Table lock Contention at 0.00% lert Summary Mysgl Temp Disk OK 02-03-2009 00:18:58 7d 18h 52m 4s 1/3 OK - Table lock Contention at 0.00% west Log Mysgl Thread Cache OK 02-03-2009 00:18:58 7d 18h 52m 4s 1/3 OK - Thread Cache Hitrate at 100.00%			Mysel Connect Time	ОК	02-03-2009 00:21:17	7d 11h 30m 24s	1/3	OK - Connection Time 0.109 seconds
Buffer OK 02-03-2009 00:17:30 04 3h 4 mm 43s 1/3 300 seconds (0.0000/sec) rends Mysql InnoDb Hit Rate OK 02-03-2009 00:17:30 24d 1h 55m 16s 1/3 OK - Innodb Buffer Pool Hitrate at 100.00% vailability Mysql Slave Lag OK 02-03-2009 00:18:00 0d 3h 41m 43s 1/3 (No output!) Iert History Mysql Table Locks OK 02-03-2009 00:18:00 0d 3h 41m 43s 1/3 OK - Table lock Contention at 0.00% Iert Summary Mysql Temp Disk OK 02-03-2009 00:18:58 7d 18h 52m 4s 1/3 OK - Thread Cache Hitrate at 100.00% Wysql Thread Cache OK 02-03-2009 00:19:27 7d 18h 52m 4s 1/3 OK - Thread Cache Hitrate at 100.00% PING OK 02-03-2009 00:19:57 7d 18h 52m 4s 1/3 PING OK - Packet loss = 0%, RTA = 34.			Mysgl ISAM Cache	ок	02-03-2009 00:21:32	24d 1h 57m 51s	1/3	OK - MyISAM Key Cache Hitrate at 100.00%
Mysci Innoboli R Rate OK 02-03-2009 00:17:30 244 In 55m 165 1/3 100.00% vailability lert Histogram Mysci Slave Lag OK 02-03-2009 00:18:00 0d 3h 41m 43s 1/3 (No output!) Jert History lert Summary obfications vent Log Mysci Table Locks OK 02-03-2009 00:18:29 8d 16h 54m 54s 1/3 OK - Table lock Contention at 0.00% Mysci Temp Disk Tables OK 02-03-2009 00:18:29 8d 16h 54m 54s 1/3 OK - Table lock Contention at 0.00% Mysci Temp Disk Tables OK 02-03-2009 00:18:58 7d 18h 52m 4s 1/3 OK - Thread Cache Hitrate at 100.00% PING OK 02-03-2009 00:19:57 7d 18h 52m 4s 1/3 PING OK - Packet loss = 0%, RTA = 34.	porting			ок	02-03-2009 00:22:01	0d 3h 41m 43s	1/3	
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Mysql Table Locks OK 02-03-2009 00:18:29 8d 18h 54m 54s 1/3 OK - Table lock Contention at 0.00% Iert Summary otifications vent Log Mysql Temp Disk Tables OK 02-03-2009 00:18:29 8d 18h 54m 54s 1/3 OK - Table lock Contention at 0.00% Mysql Temp Disk Tables OK 02-03-2009 00:18:58 7d 18h 52m 4s 1/3 OK - Thread Cache Hitrate at 100.00% PING OK 02-03-2009 00:19:57 7d 18h 52m 4s 1/3 PING OK - Packet loss = 0%, RTA = 34.			Mysol Slave Lag 🛛 💭	ок	02-03-2009 00:18:00	0d 3h 41m 43s	1/3	(No output!)
Tables OK 02-03-2009 00:18:56 7d 16H 52m 4s 1/3 Created on disk vent Log Mysql Thread Cache OK 02-03-2009 00:19:27 7d 18h 52m 4s 1/3 OK - Thread Cache Hitrate at 100.00% PING OK 02-03-2009 00:19:57 7d 18h 52m 4s 1/3 PING OK - Packet loss = 0%, RTA = 34.	ert History		Mysgl Table Locks	OK	02-03-2009 00:18:29	8d 16h 54m 54s	1/3	OK - Table lock Contention at 0.00%
PING OK 02-03-2009 00:19:57 7d 18b 52m 4s 1/3 PING OK - Packet loss = 0%, RTA = 34.				ок	02-03-2009 00:18:58	7d 18h 52m 4s	1/3	OK - 17.26% of 1657296 temp tables wer created on disk
PING UZ	vent Log		Mysol Thread Cache	ОК	02-03-2009 00:19:27	7d 18h 52m 4s	1/3	
	nfiguration		PING	ок	02-03-2009 00:19:57	7d 18h 52m 4s	1/3	

DUPLEATEDCODE

DUPLICATED CODE EVERYWHERE

More configuration management

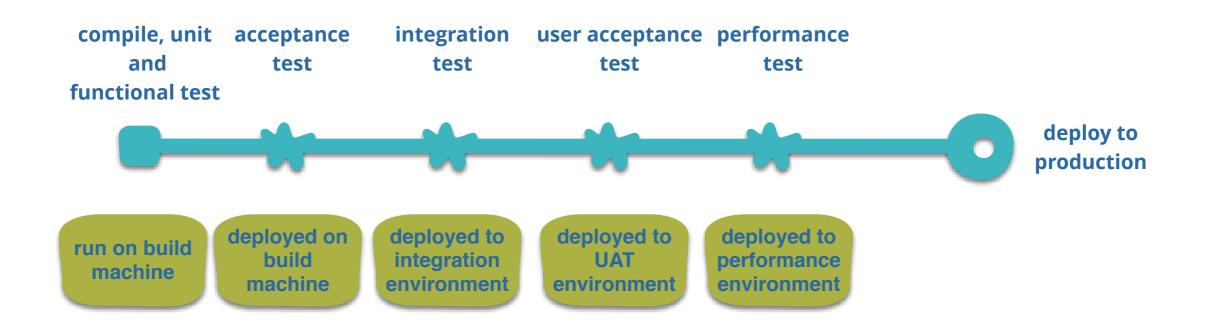




http://www.clker.com



Deployment



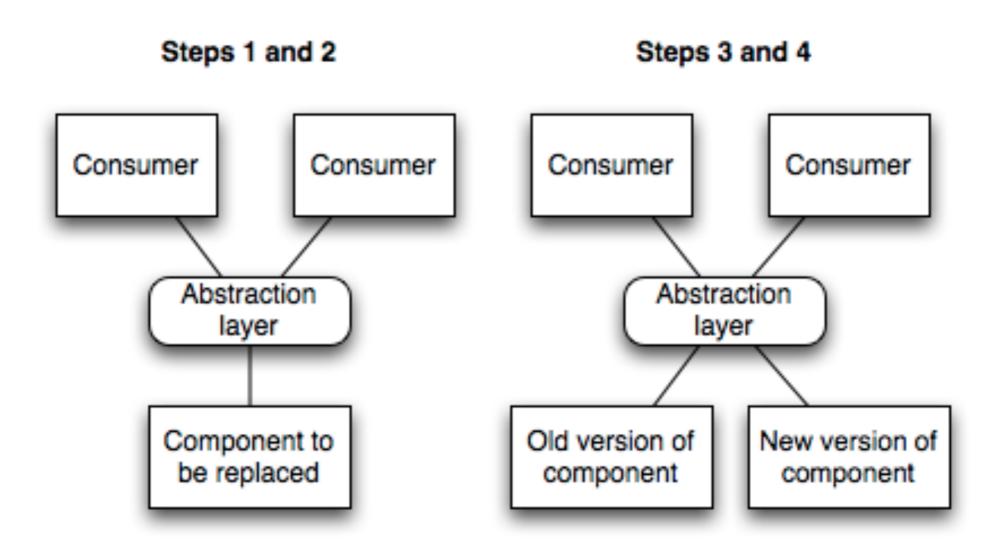
□ What are micro-services?

□ Why do we want them? Or maybe not..

What are the key challenges?

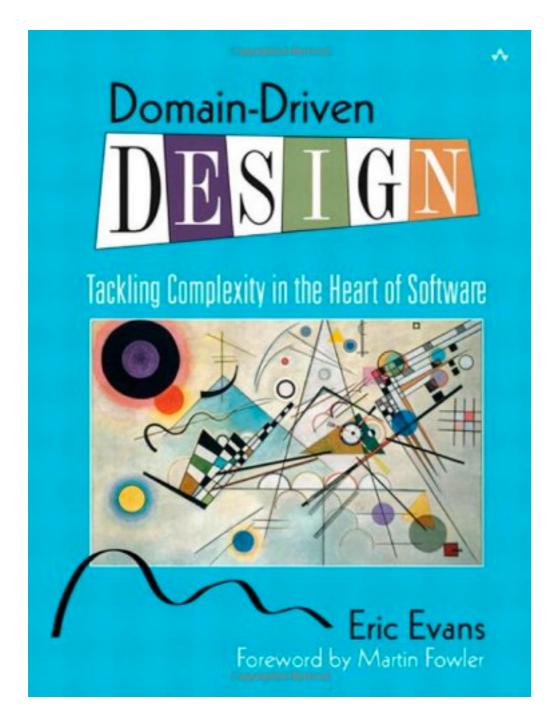
□ Are they the anti pattern of the future?

1. FINDING SEAMS



http://continuousdelivery.com/wp-content/uploads/2011/05/branch_by_abstraction.png

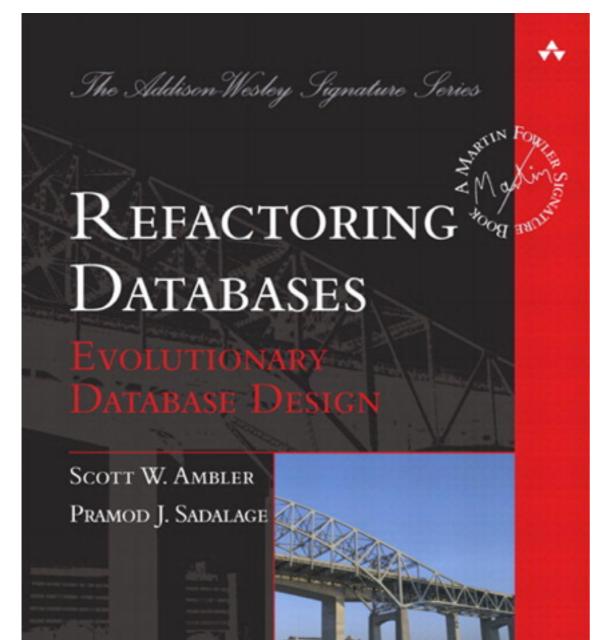
BOUNDED CONTEXT



Domain Driven Design



CHANGING DATA



Forewords by Martin Fowler, John Graham, Sachin Rekhi, and Dr. Paul Dorsey

Refactoring Databases

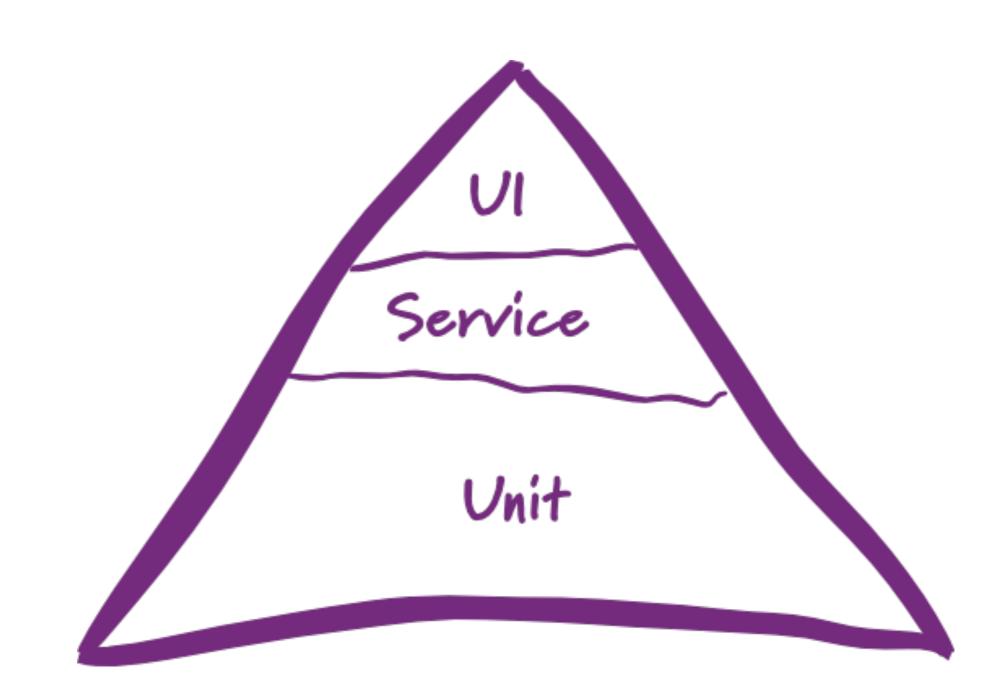
"One True Customer"

http://devlicio.us/blogs/casey/archive/2009/05/14/commercial-suicide-integration-at-the-database-level.aspx

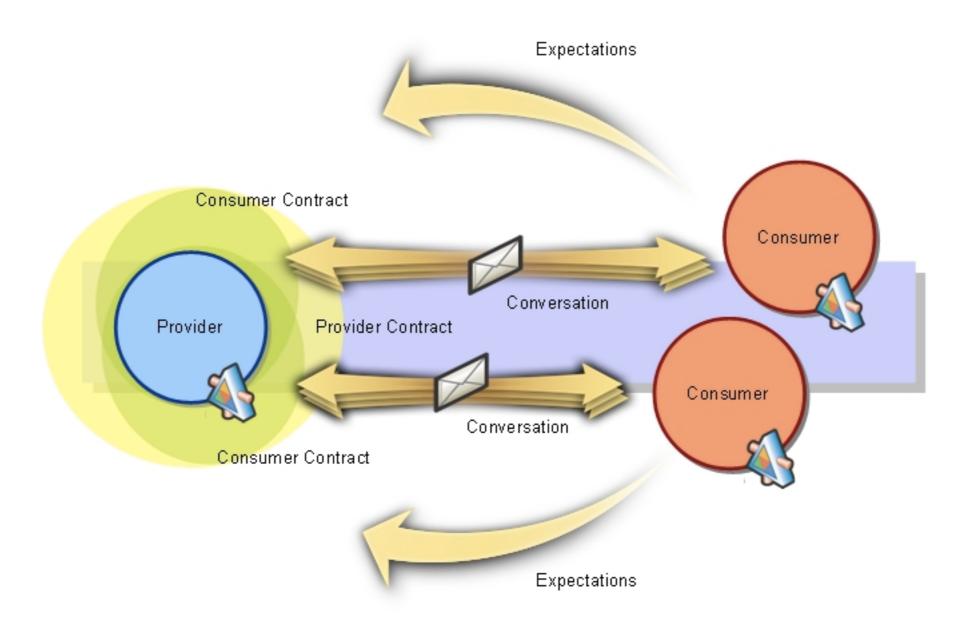
"coz reporting"

http://devlicio.us/blogs/casey/archive/2009/05/14/commercial-suicide-integration-at-the-database-level.aspx

3. TESTING



CONSUMER DRIVEN CONTRACTS



http://martinfowler.com/articles/consumerDrivenContracts.html

MONITORING

3		onsulting.com/nagio	- /			G ~ Qr (loogie
		Tables	ОК	02-03-2009 00:19:13	0d 2h 51m 0s	1/3	created on disk
Janine'		Mysol Thread Cache	ок	02-03-2009 00:19:42	0d 2h 50m 31s	1/3	OK - Thread Cache Hitrate at 99.89%
lagios		PING P	ок	02-02-2009 21:33:20	0d 2h 49m 50s	1/3	No data yet (service was in a soft problem state during state retention)
neral ome ocumentation	monitor.tag1consulting.com	Disk Check	ОК	02-03-2009 00:17:41	0d 0h 54m 39s	1/3	DISK OK - free space: / 35084 MB (97% inode=98%):
		Mysol Buffer Waits	ок	02-03-2009 00:18:10	0d 0h 54m 9s	1/3	OK - 0 Innodb buffer pool waits in 300 seconds (0.0000/sec)
nitoring		Mysel Connect Time	OK	02-03-2009 00:18:24	0d 0h 53m 49s	1/3	OK - Connection Time 0.003 seconds
ctical Overview rvice Detail est Detail atus Overview atus Summary atus Grid		Mysql ISAM Cache 💭	ок	02-03-2009 00:21:54	0d 0h 40m 19s	1/3	OK - MyISAM Key Cache Hitrate at 97.33%
		Mysgl InnoDB Log Buffer	ок	02-03-2009 00:19:23	0d 0h 57m 49s	1/3	OK - 0 Innodb log write requests waiting i 300 seconds (0.0000/sec)
		Mysel InnoDb Hit Rate	CRITICAL	02-03-2009 00:17:52	24d 23h 24m 8s	3/3	CRITICAL - Innodb Buffer Pool Hitrate at 84.42%
atus Map		Mysel Slave Lag 🛛 💭	ок	02-03-2009 00:20:22	0d 0h 56m 59s	1/3	(No output!)
Status Map		Mysql Table Locks	OK	02-03-2009 00:20:51	0d 0h 56m 29s	1/3	OK - Table lock Contention at 0.00%
rvice Problems		Mysgl Temp Disk Tables	ок	02-03-2009 00:21:20	0d 0h 55m 59s	1/3	OK - 0.00% of 180 temp tables were created on disk
st Problems		Mysol Thread Cache	ОК	02-03-2009 00:21:49	0d 0h 55m 29s	1/3	OK - Thread Cache Hitrate at 99.70%
otwork Outages		PING	ок	02-03-2009 00:20:19	21d 5h 22m 18s	1/3	PING OK - Packet loss = 0%, RTA = 0.0 ms
wntime	www.tag1consulting.com	Mysgl Buffer Waits	ок	02-03-2009 00:20:48	0d 3h 38m 3s	1/3	OK - 0 Innodb buffer pool waits in 299 seconds (0.0000/sec)
ocess Info		Mysel Connect Time	ОК	02-03-2009 00:21:17	7d 11h 30m 24s	1/3	OK - Connection Time 0.109 seconds
erformance Info cheduling Queue porting		Mysgl ISAM Cache	ок	02-03-2009 00:21:32	24d 1h 57m 51s	1/3	OK - MyISAM Key Cache Hitrate at 100.00%
		Mysgl InnoDB Log Buffer	ок	02-03-2009 00:22:01	0d 3h 41m 43s	1/3	OK - 0 Innodb log write requests waiting i 300 seconds (0.0000/sec)
ends railability		Mysgl InnoDb Hit Rate	ок	02-03-2009 00:17:30	24d 1h 55m 16s	1/3	OK - Innodb Buffer Pool Hitrate at 100.00%
ert Histogram		Mysol Slave Lag 🛛 💭	ок	02-03-2009 00:18:00	0d 3h 41m 43s	1/3	(No output!)
ert History		Mysql Table Locks	OK	02-03-2009 00:18:29	8d 16h 54m 54s	1/3	OK - Table lock Contention at 0.00%
ert Summary tifications		<u>Mysql Temp Disk</u> Tables	ок	02-03-2009 00:18:58	7d 18h 52m 4s	1/3	OK - 17.26% of 1657296 temp tables wer created on disk
ent Log		Mysol Thread Cache	ОК	02-03-2009 00:19:27	7d 18h 52m 4s	1/3	OK - Thread Cache Hitrate at 100.00%
figuration		PING	ок	02-03-2009 00:19:57	7d 18h 52m 4s	1/3	PING OK - Packet loss = 0%, RTA = 34.0 ms

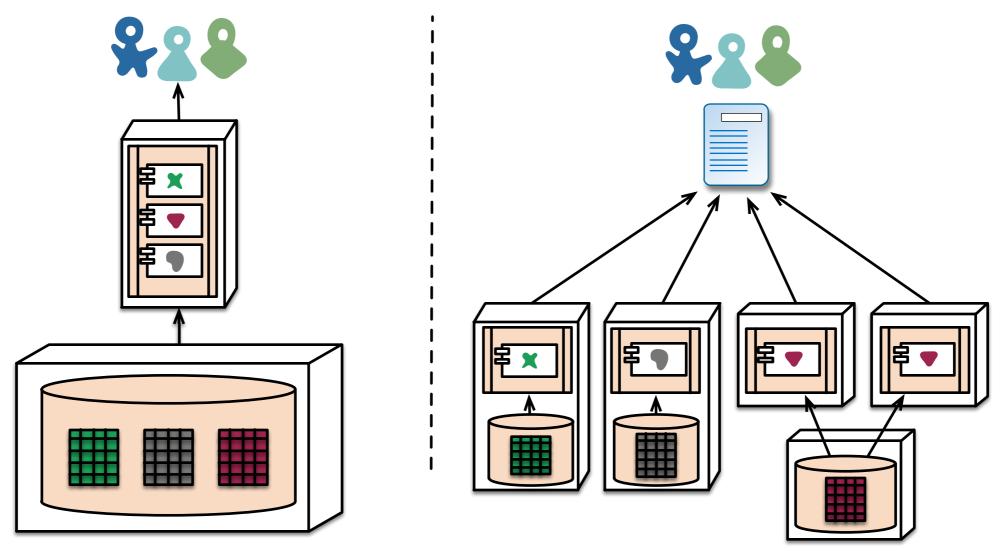
□ What are micro-services?

□ Why do we want them? Or maybe not..

□ What are the key challenges?

Are they the anti pattern of the future?

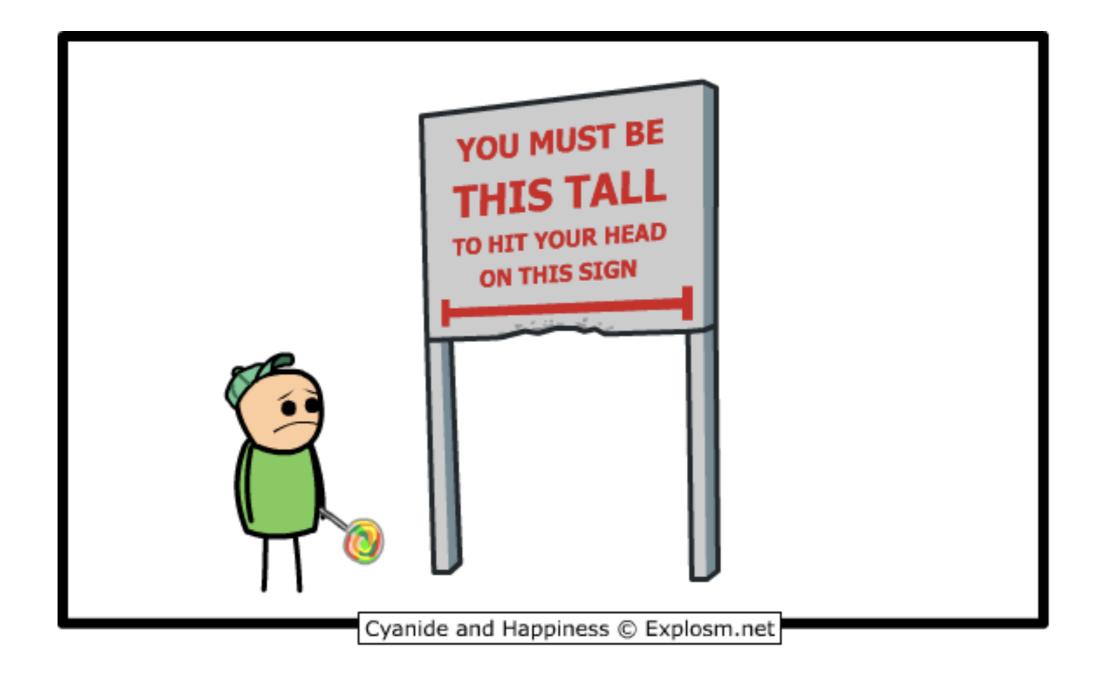
THE MONOLITH BACKLASH



monolith - single database

microservices - application databases

MATURITY



http://37.media.tumblr.com/tumblr_lp1ys7Qava1qe6m28o1_1280.png

www.gamesdbase.com

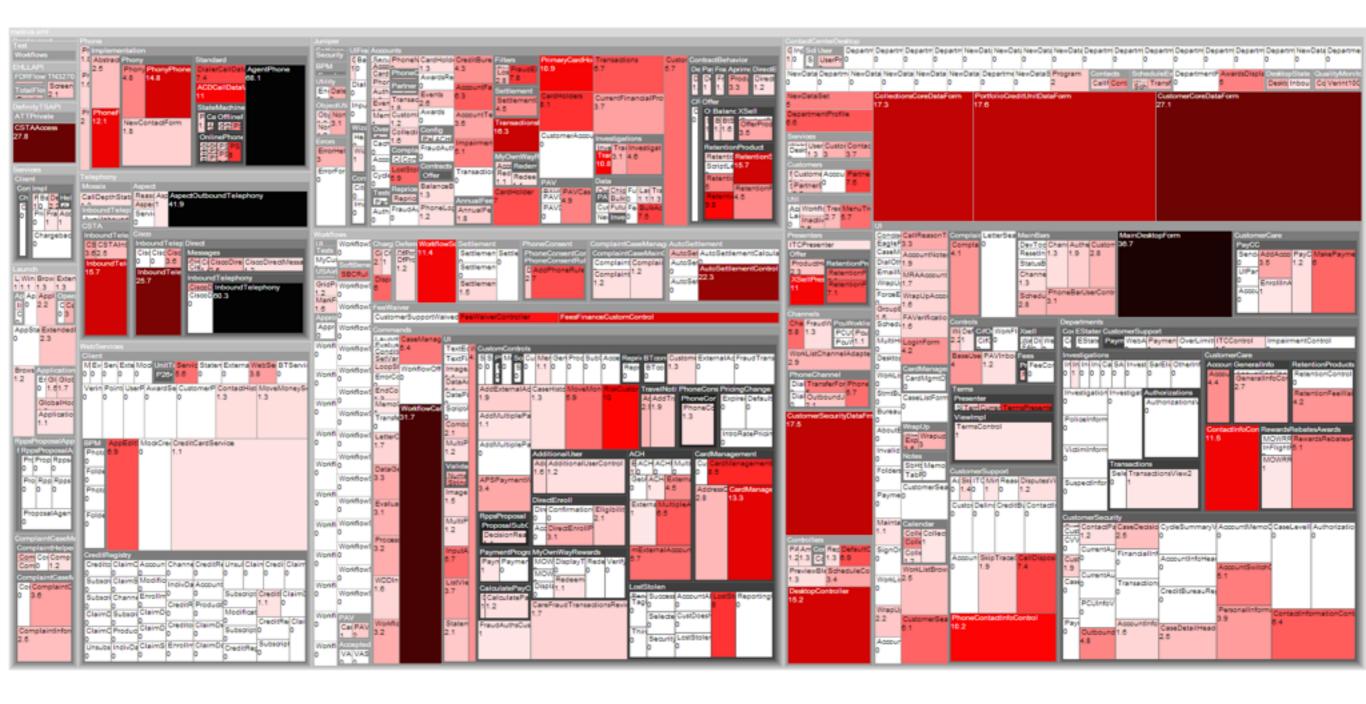
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2. ARCHITECT FOR EVOLVABILITY



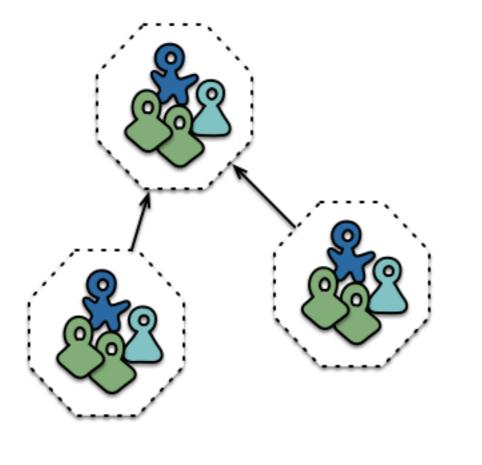
3. POSTEĽS LAW

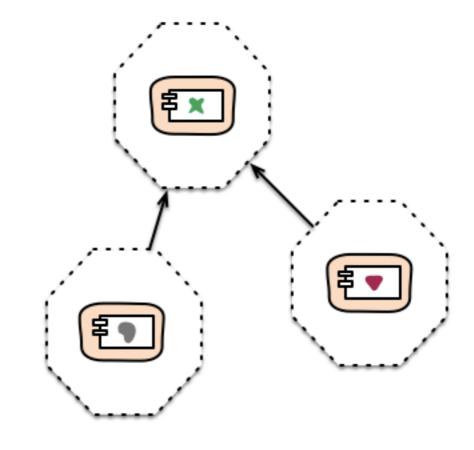
"Be conservative in what you send, be liberal in what you accept"

4. ARCHITECT FOR TESTABILITY



5. CONWAY'S LAW





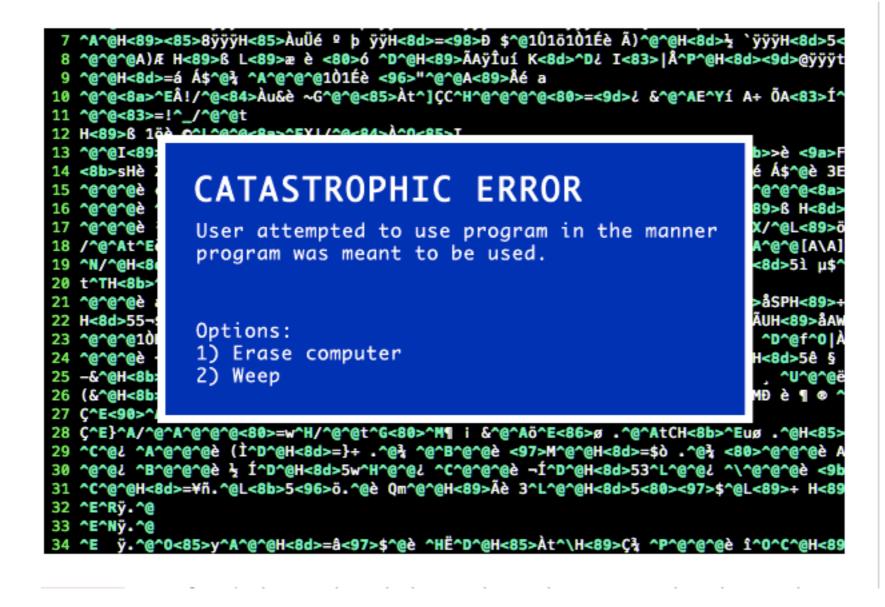
Cross-functional teams...

... organised around capabilities Because Conway's Law

http://stilldrinking.org/programming-sucks

Programming Sucks

Composed on the 27th of April in the year 2014, at 12:52 PM. It was Sunday.



THANK YOU!

Rachel Laycock @rachellaycock



ThoughtWorks®

Resources

Books:

- Continuous Delivery Jez Humble, Dave Farley
- Working Effectively with Legacy Code Michael Feathers
- Domain Driven Design Eric Evans
- Your Brain at Work David Rock
- Refactoring Databases Scott W Ambler & Pramod Sadalage
- Building Microservices Sam Newman

Articles/Blogs:

- Ball of Mud: <u>http://www.laputan.org/mud/</u>
- Demming <u>http://leanandkanban.wordpress.com/2011/07/15/demings-14-points/</u>
- Coding Horror: <u>http://www.codinghorror.com/blog/2007/11/the-big-ball-of-mud-and-other-architectural-disasters.html</u>
- http://devlicio.us/blogs/casey/archive/2009/05/14/commercial-suicide-integration-at-the-database-level.aspx
 Evolutionary Architecture and Emergent Design: http://www.ibm.com/developerworks/java/library/j-eaed1/
- Microservices: <u>http://www.infoq.com/presentations/Micro-Services</u> and <u>http://yobriefca.se/blog/2013/04/29/</u> micro-service-architecture/ and <u>http://davidmorgantini.blogspot.co.uk/2013/08/micro-services-what-are-micro-services.html</u>
- <u>http://martinfowler.com/articles/microservices.html</u>
- <u>http://highscalability.com/blog/2014/4/8/microservices-not-a-free-lunch.html</u>