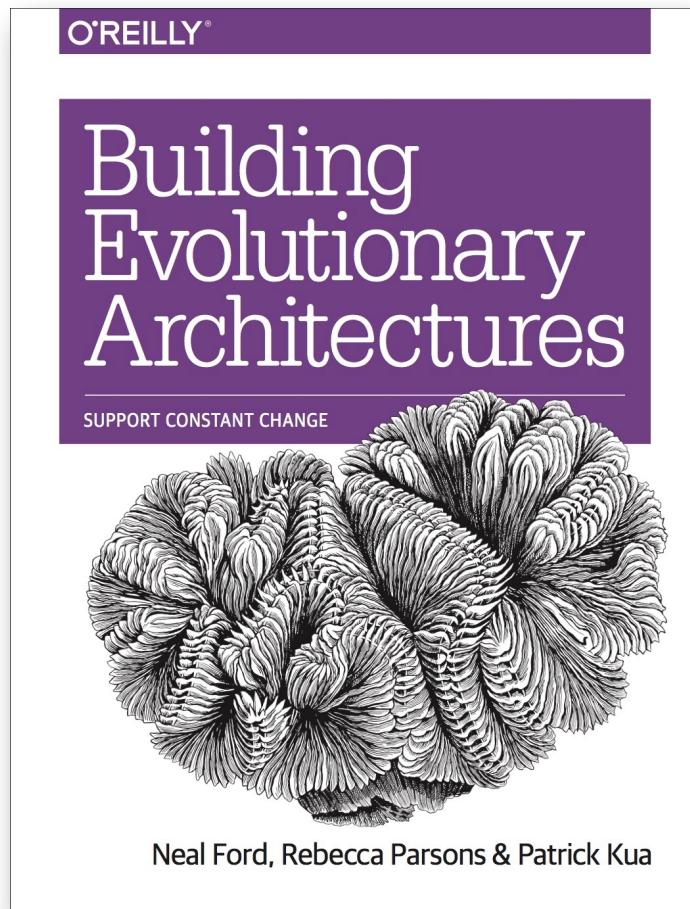


iMpLemENtiNg eVoLuTiONaRy ARcHiEcTuREs



 @neal4d
nealford.com



 @rebeccaparsons



 @patkua



Evolutionary Architecture

An evolutionary architecture supports
guided,
incremental change
across multiple dimensions.



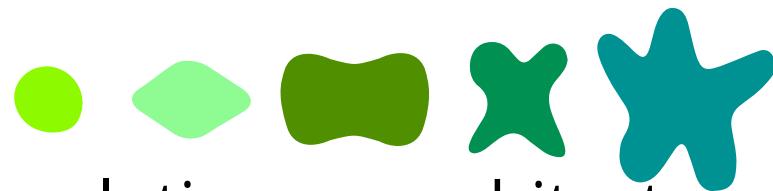


architectural fitness function:

An architectural fitness function provides an objective integrity assessment of some architectural characteristic(s).

Exercise:

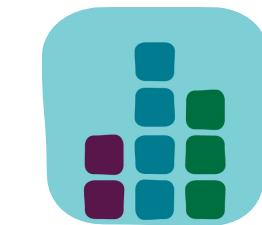
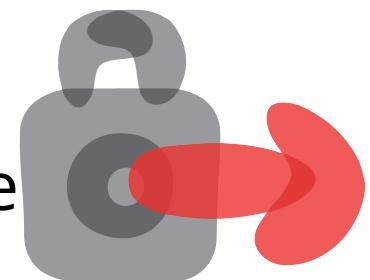
What type of fitness function?



evolutionary architecture



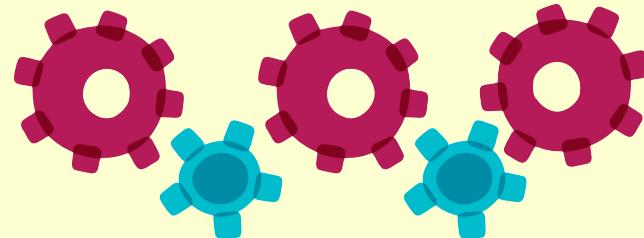
governance



enterprise architecture

Agenda Part 2

The Evolution of
Penultima↑e



Agenda Part 2

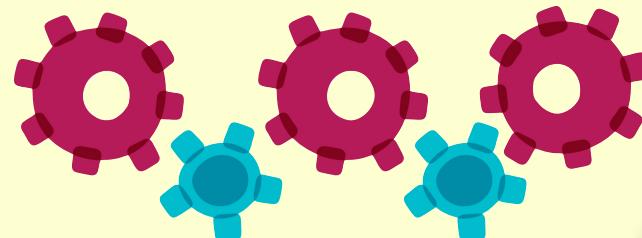
fitness functions

architecture migration

experimentation

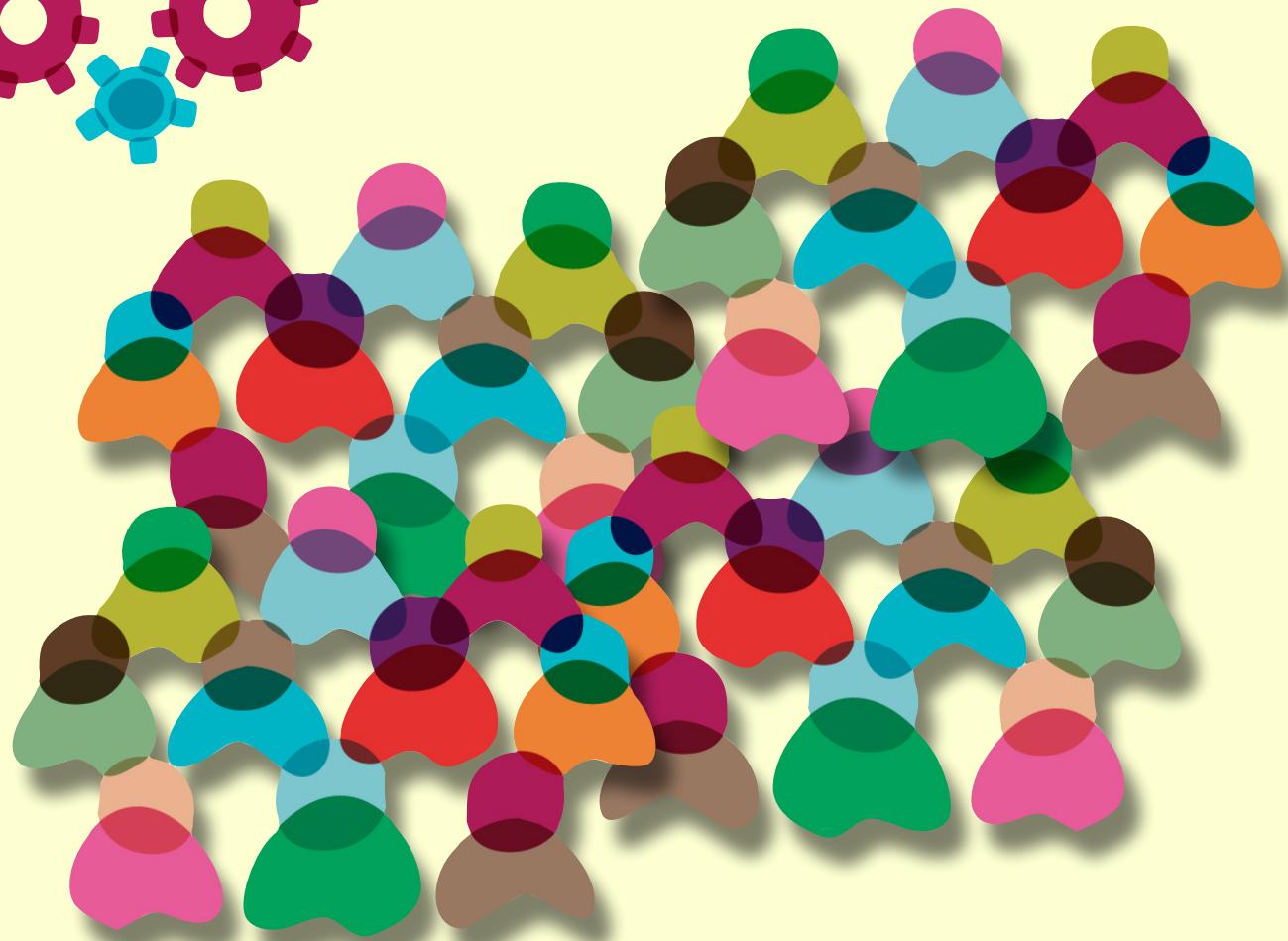
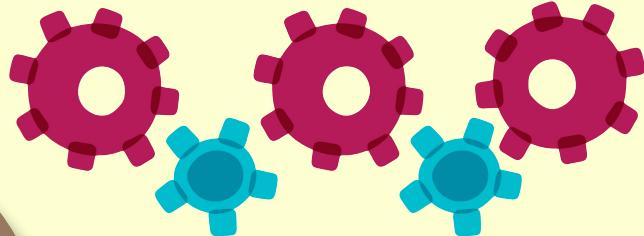
automating
governance

The Evolution of
Penultima ↑ e

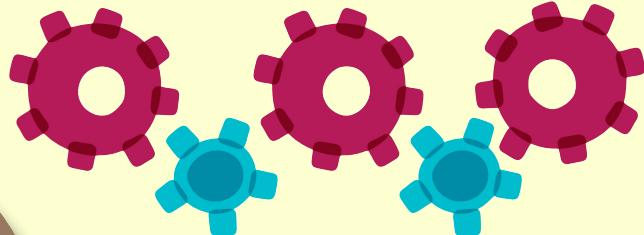
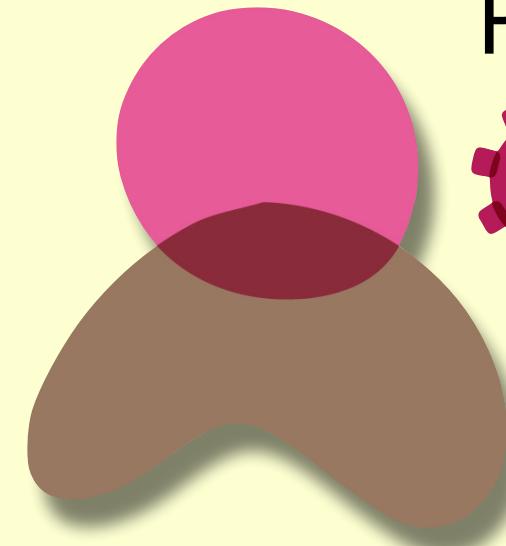


hypothesis/data driven
development

Penultima ↑ e



Penultimate ↑ e



pe·nul·ti·mate

/pə'neltəmət/

adjective

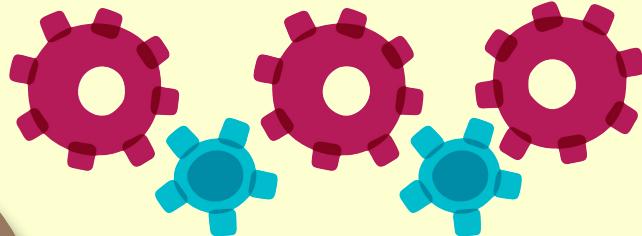
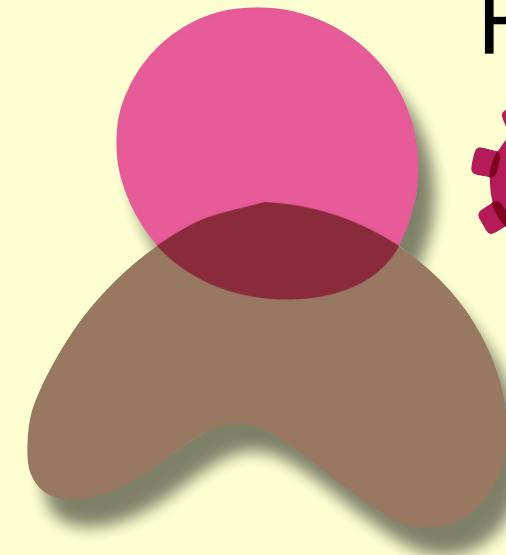
last but one in a series of things; second to the last.

"the penultimate chapter of the book"

synonyms: next-to-last, second-to-last, second-last

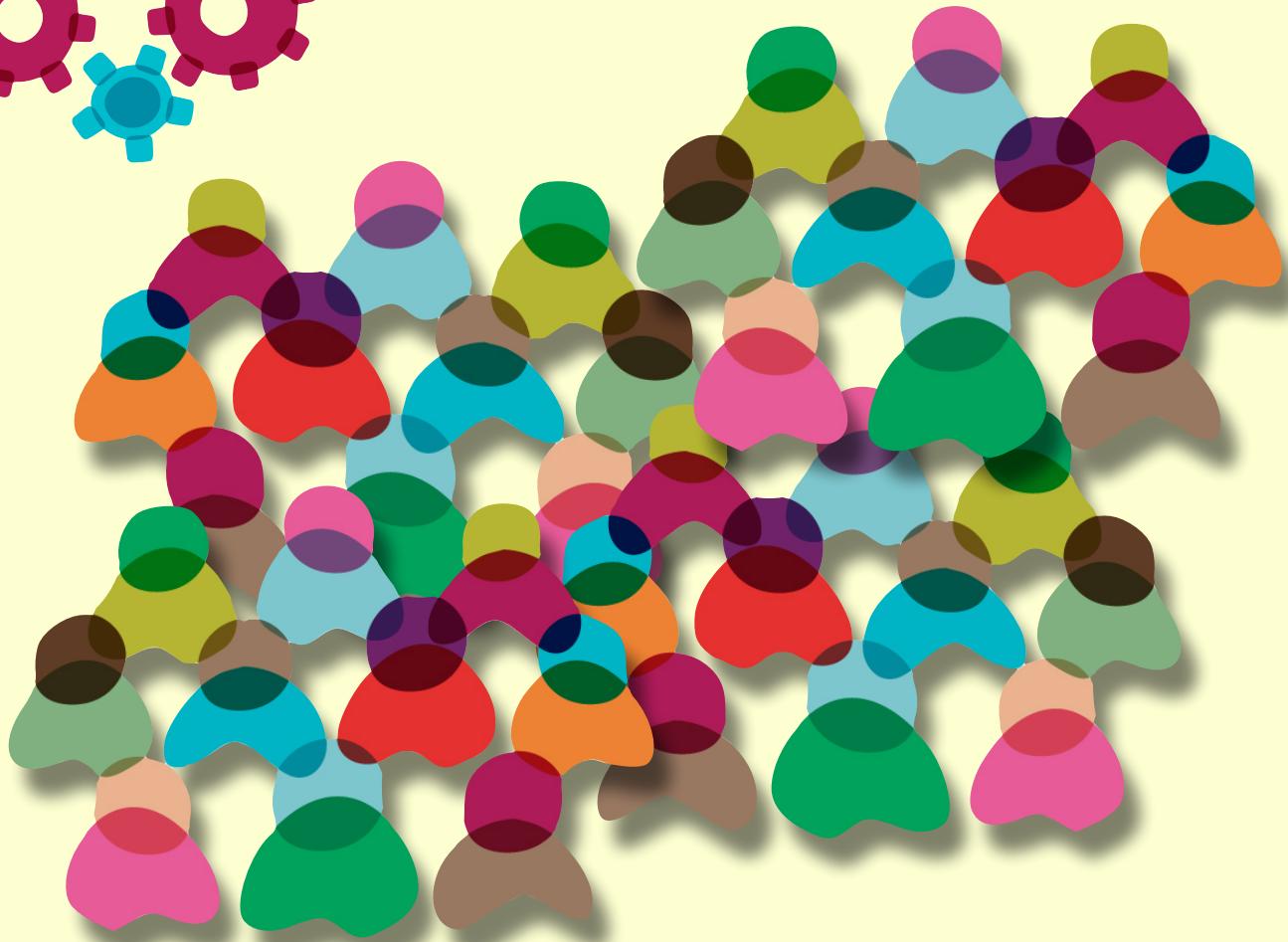
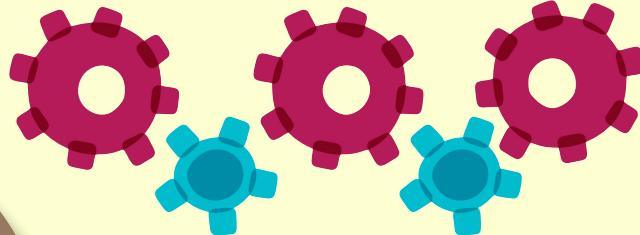
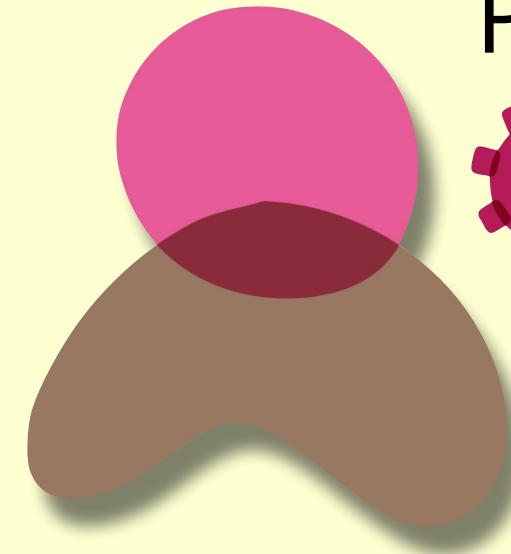
"the penultimate movie on my top-ten list is an animated feature"

Penultima ↑ e



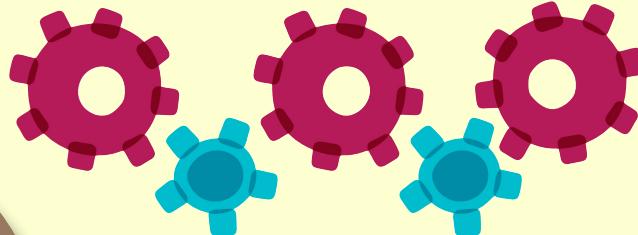
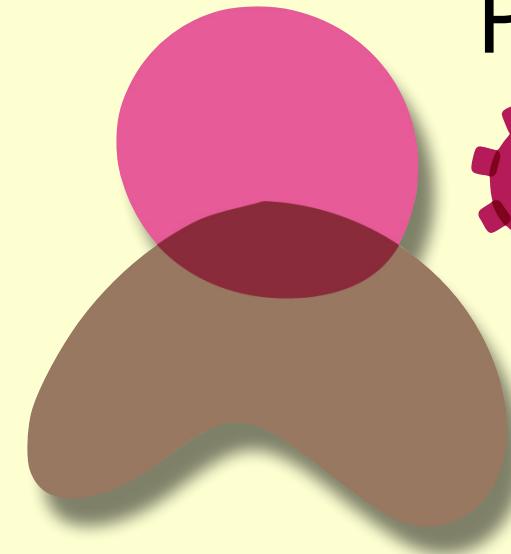
— many outdated systems

Penultima↑e



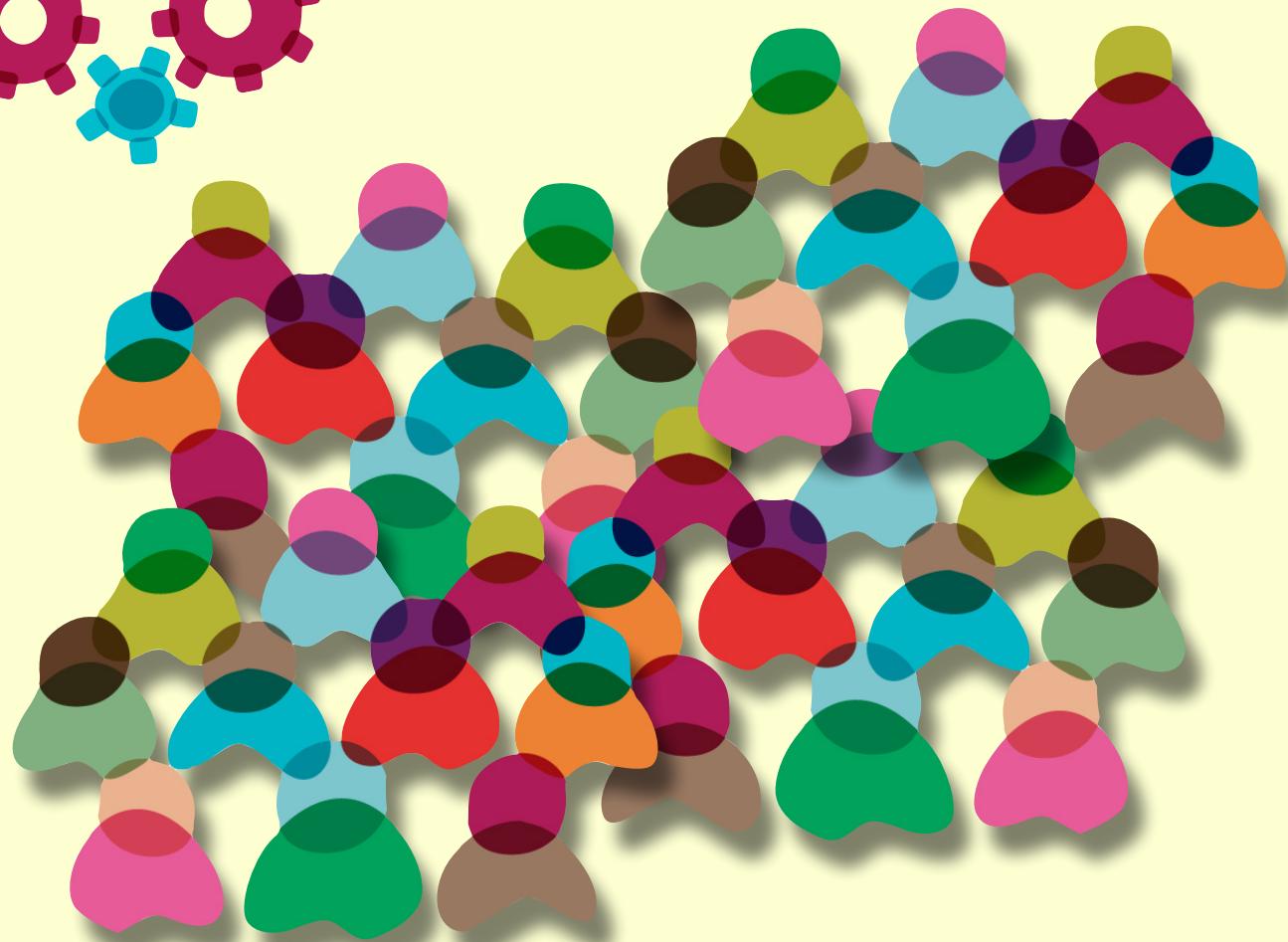
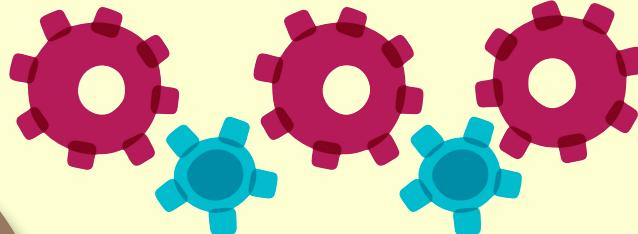
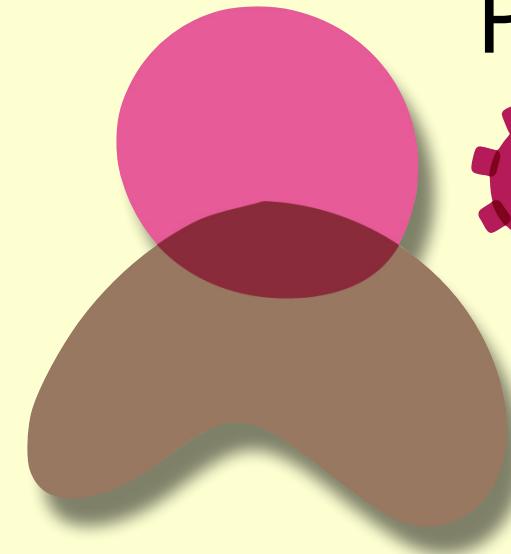
- many outdated systems
- outsourced operations

Penultimate ↑ e



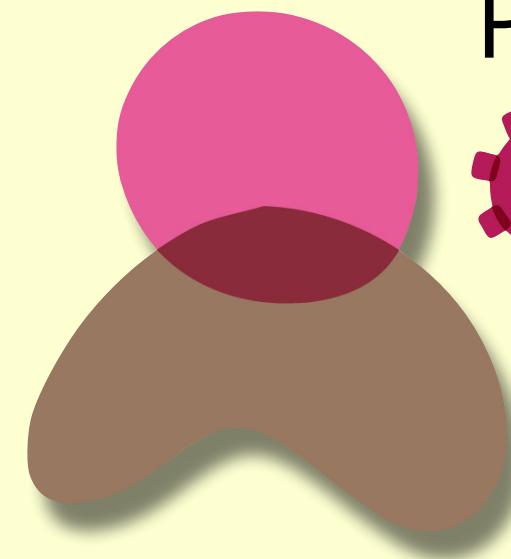
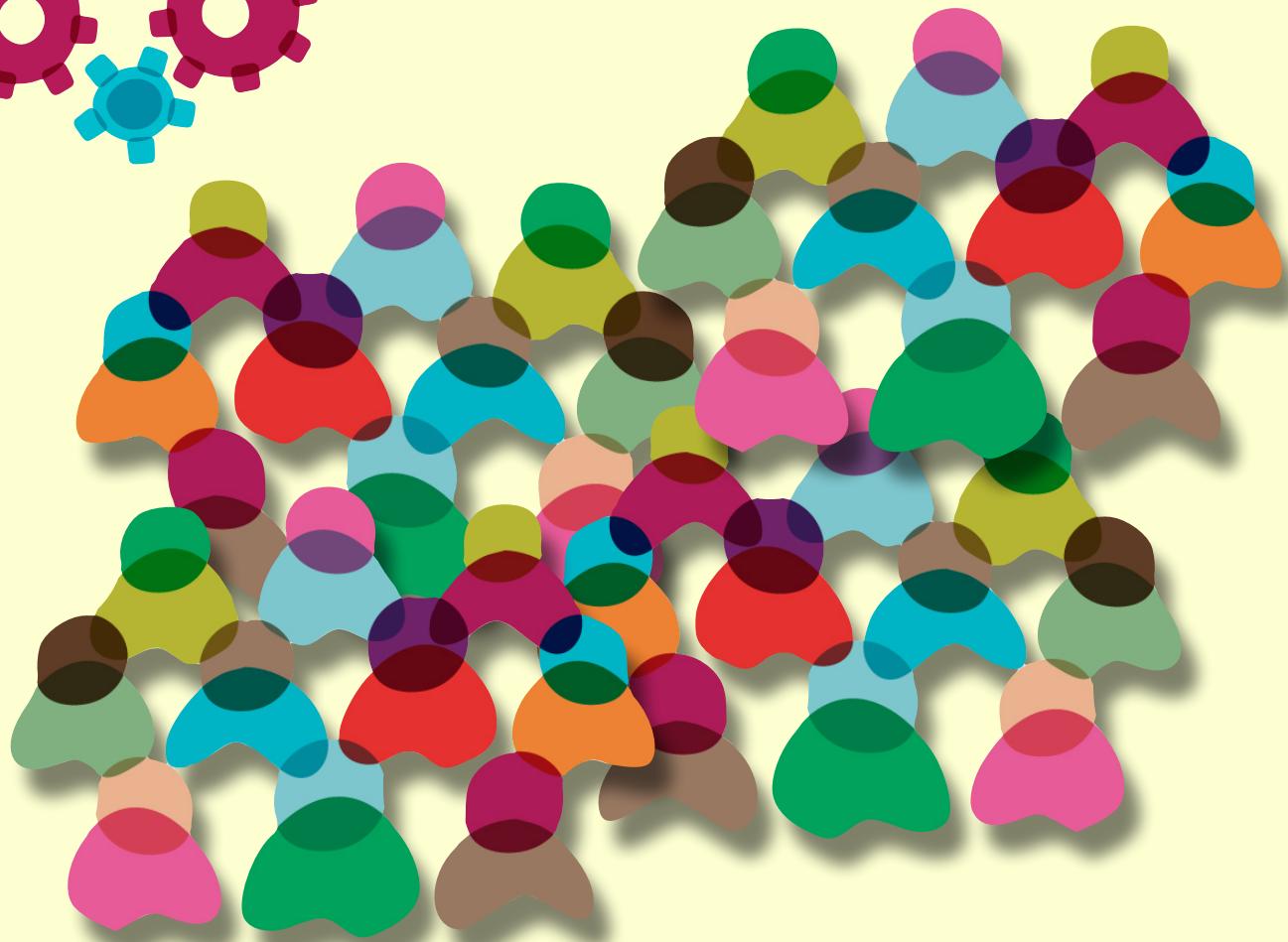
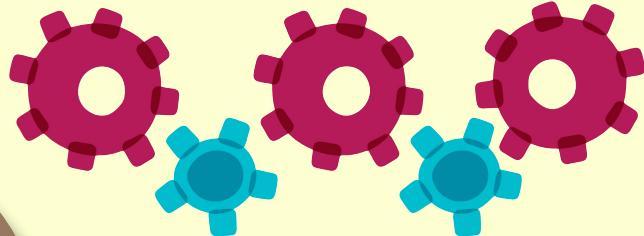
- many outdated systems
- outsourced operations
- impending competitors

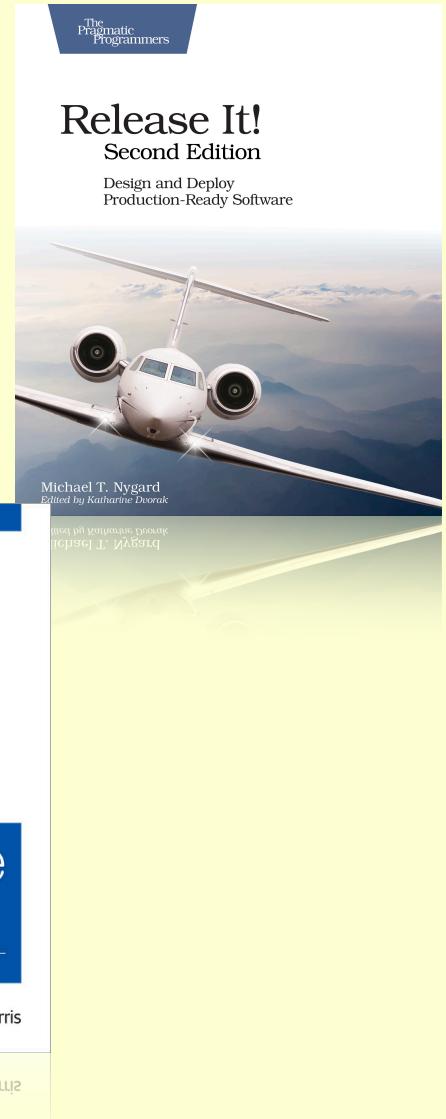
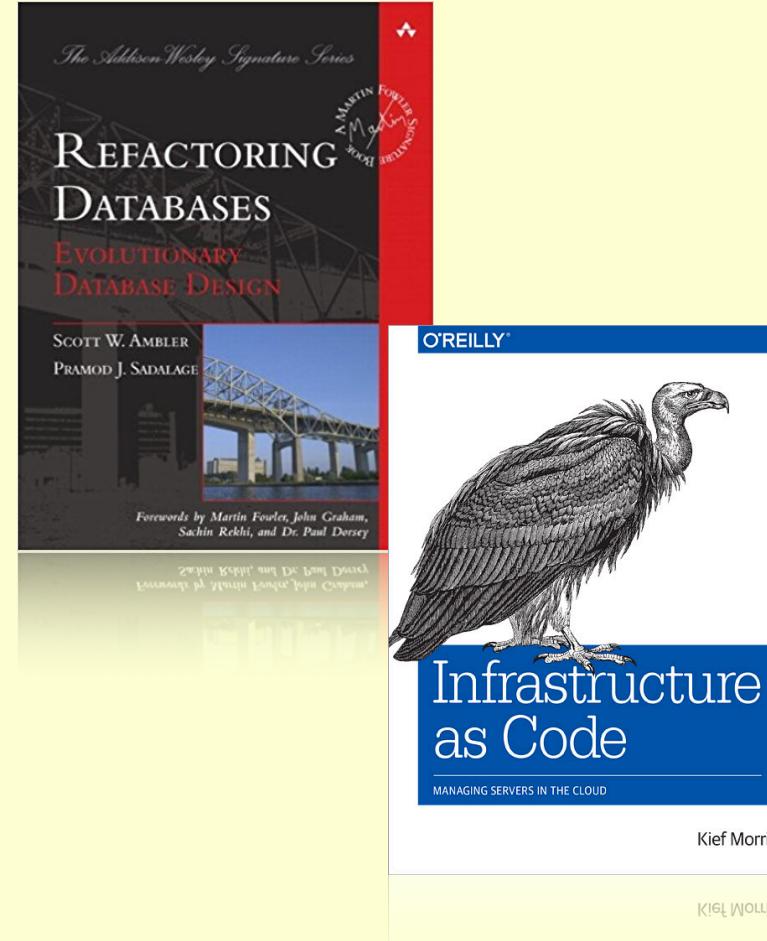
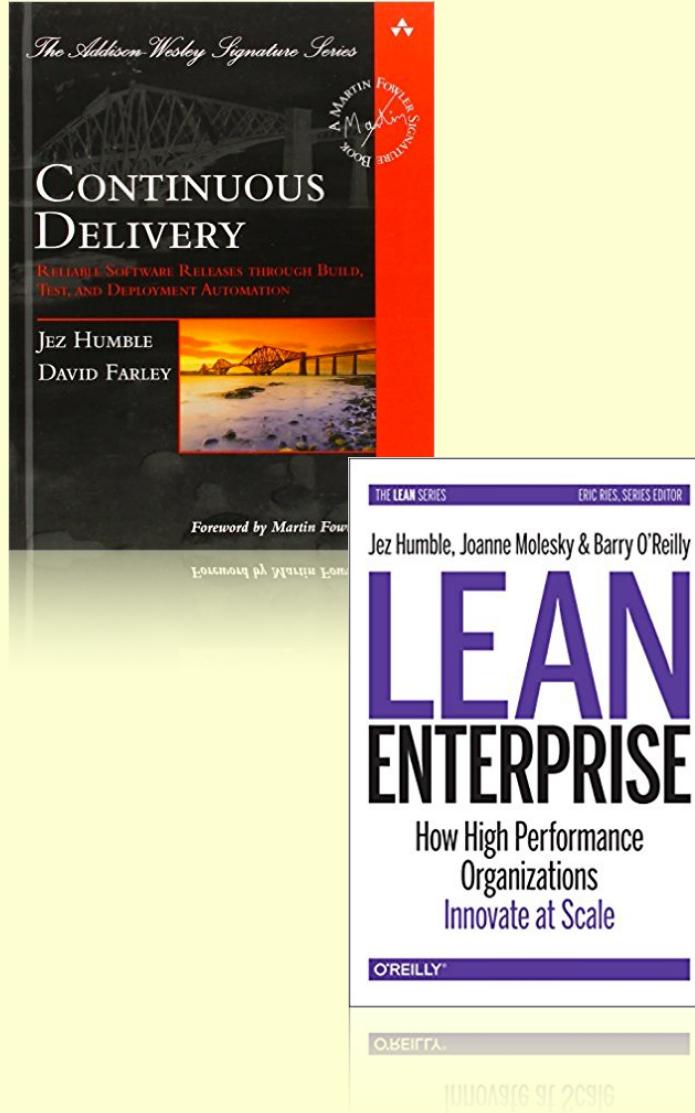
Penultimate ↑ e

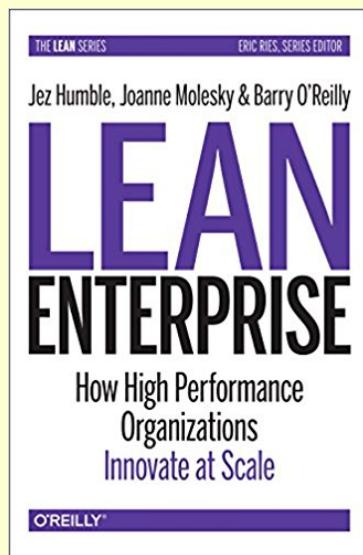
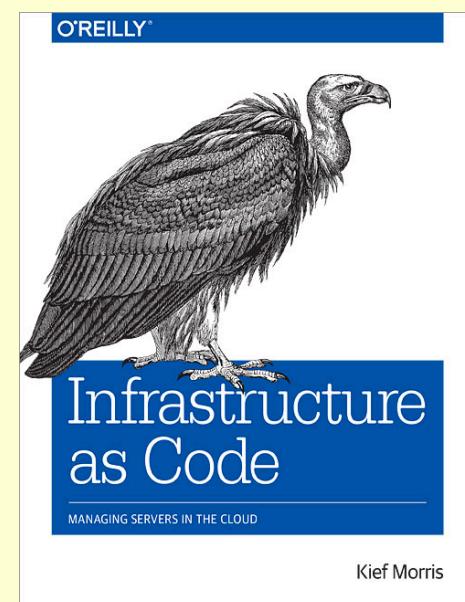
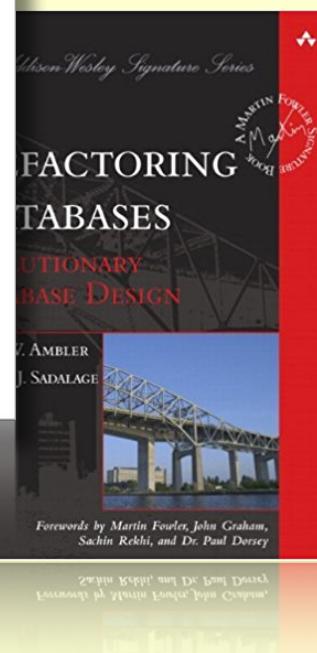
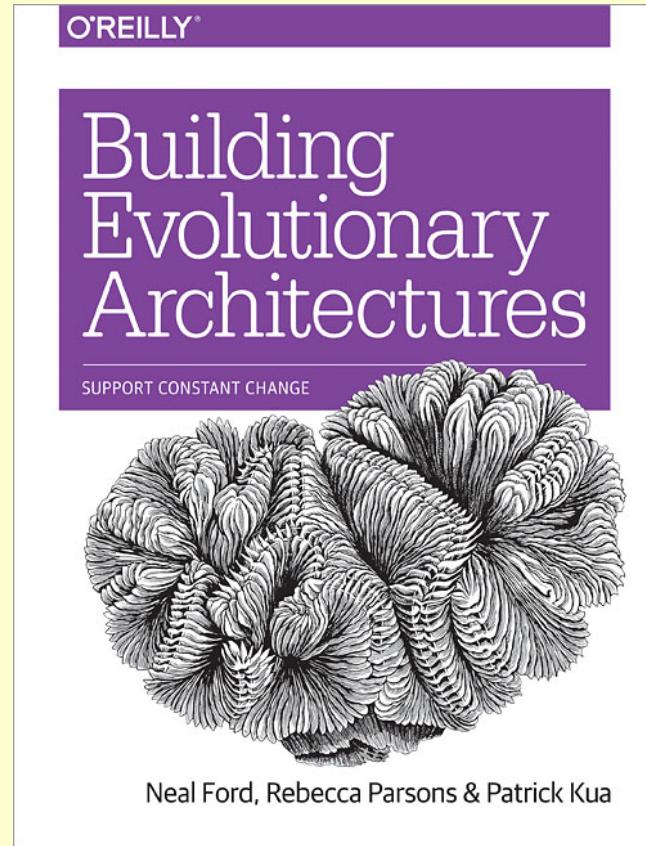
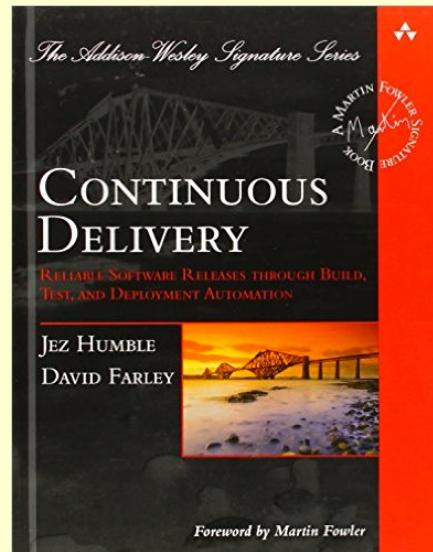


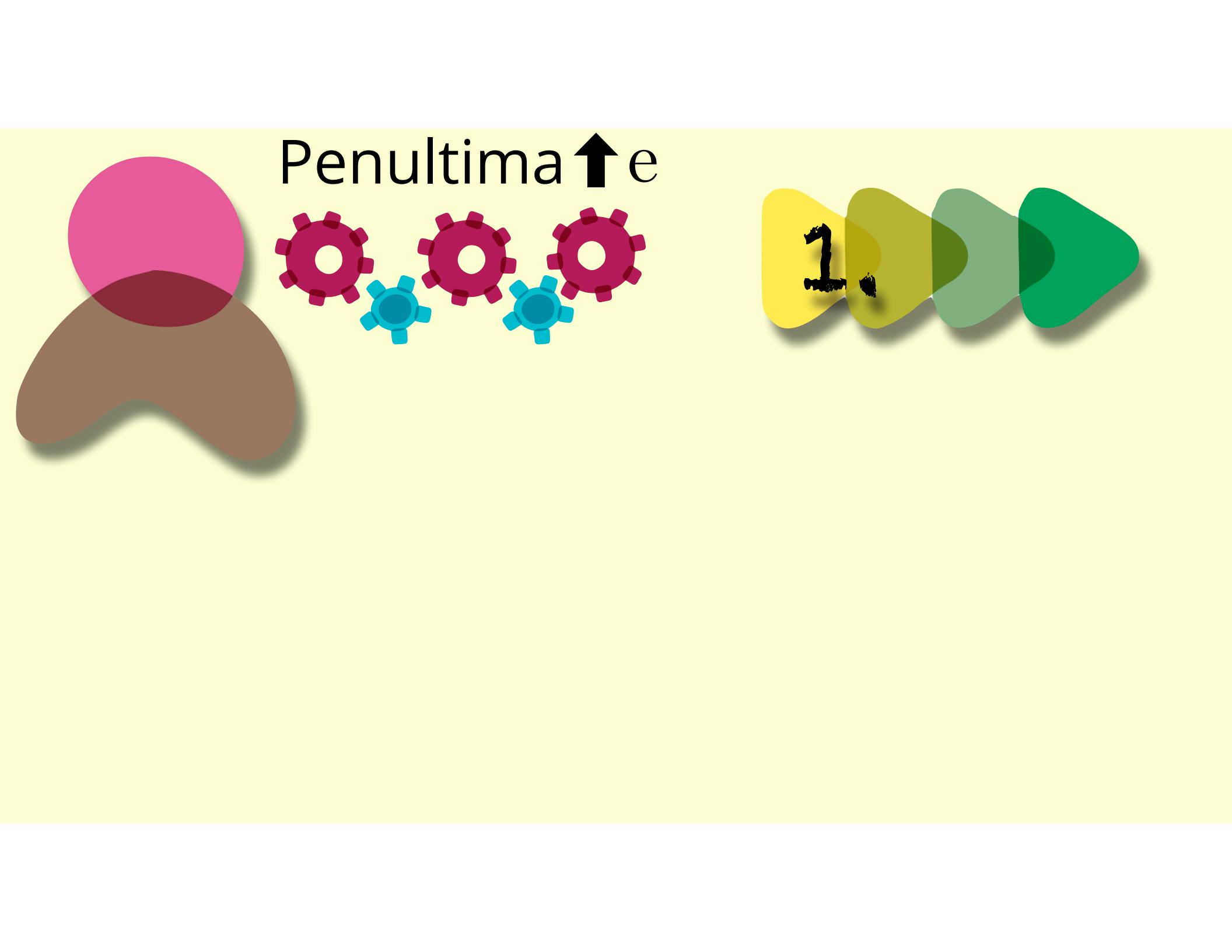
- many outdated systems
- outsourced operations
- impending competitors
- second to last in market!

Penultima ↑ e

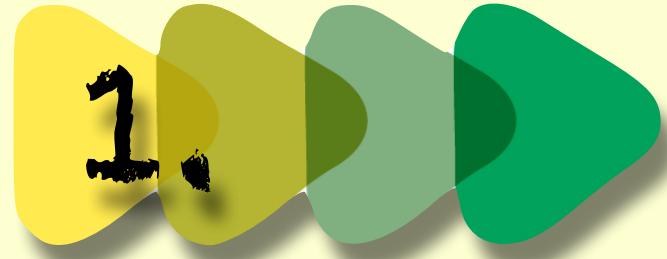
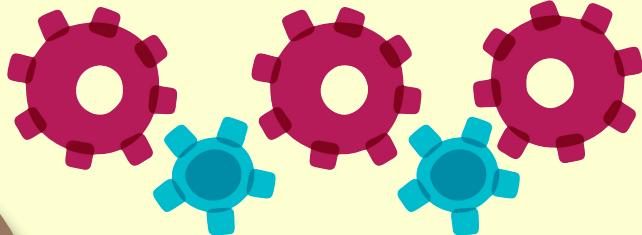




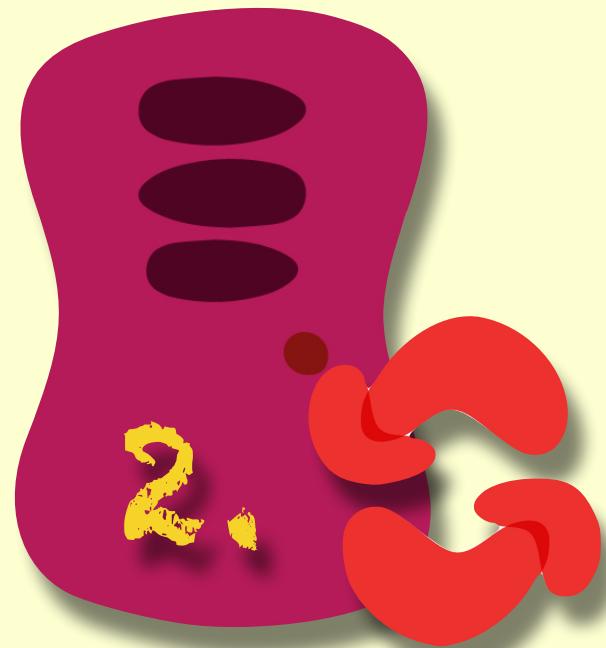
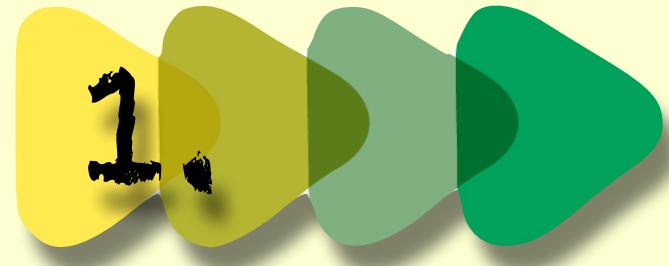
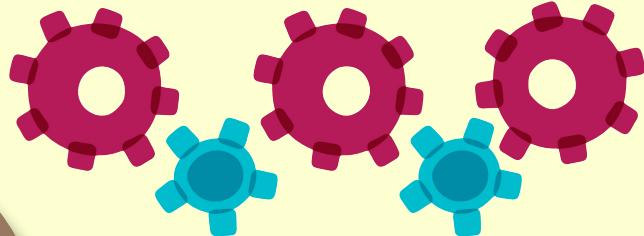




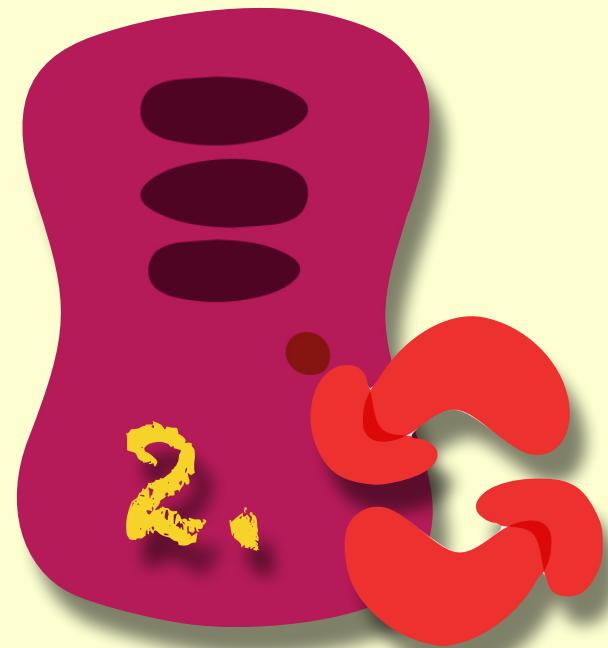
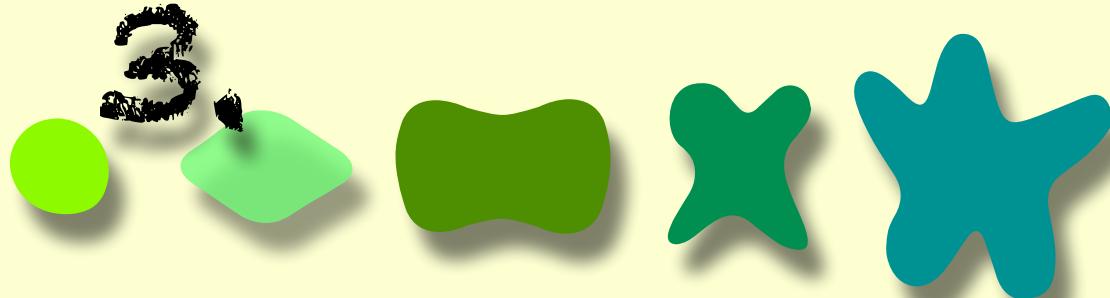
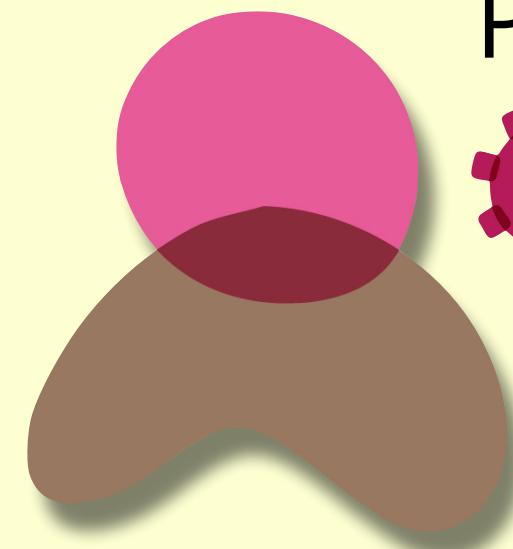
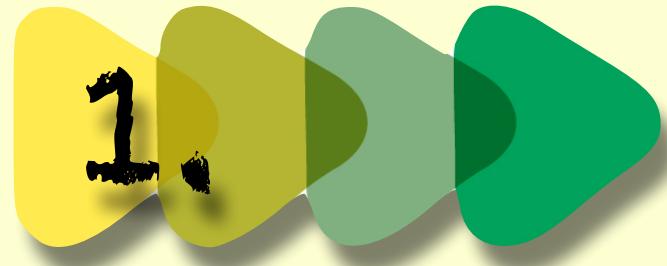
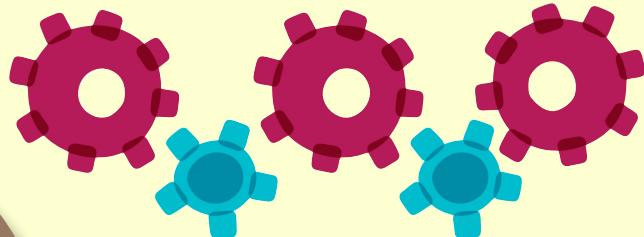
Penultima ↑ e



Penultima ↑ e

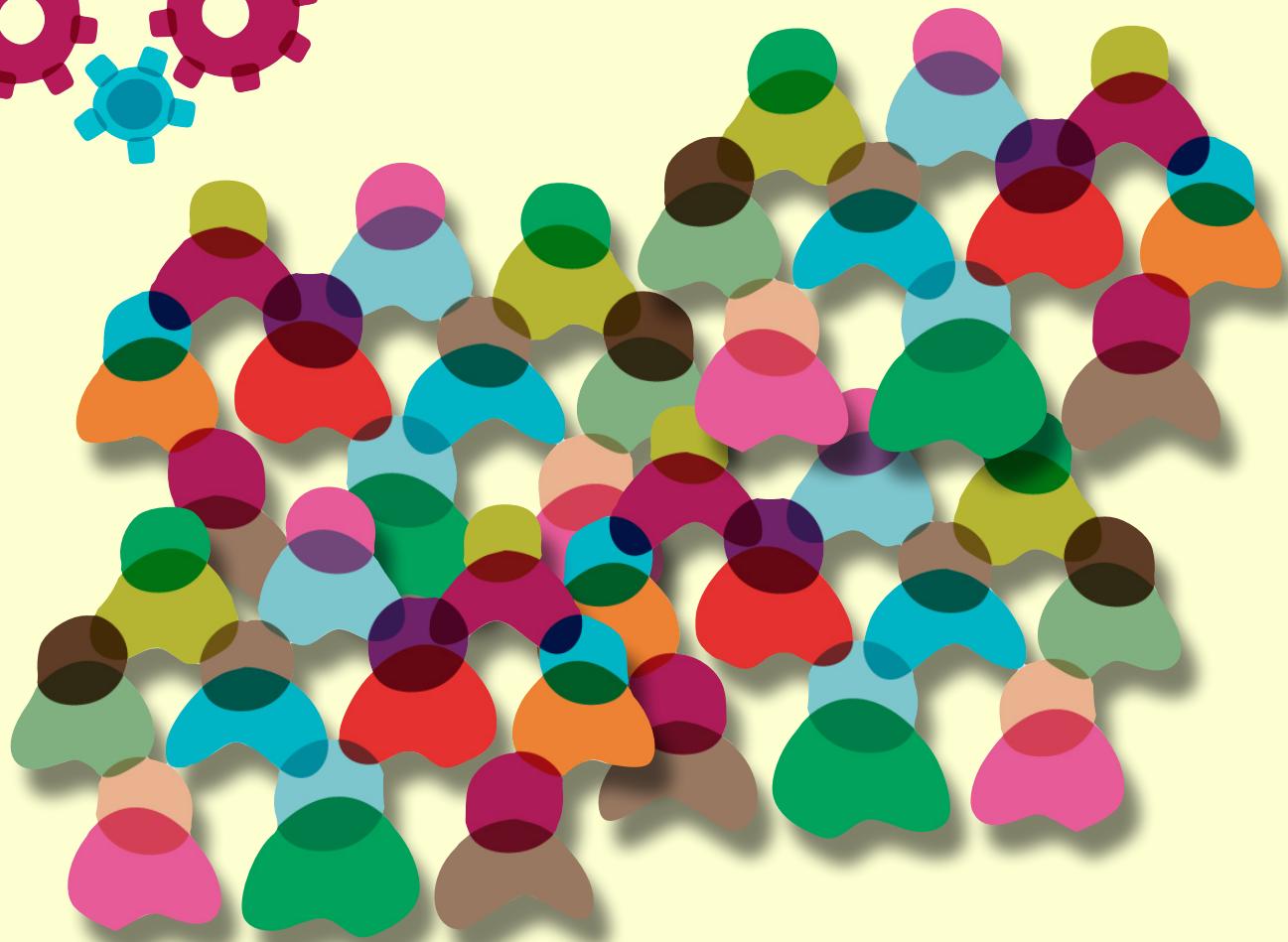
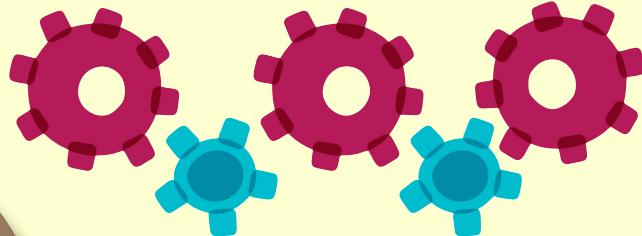


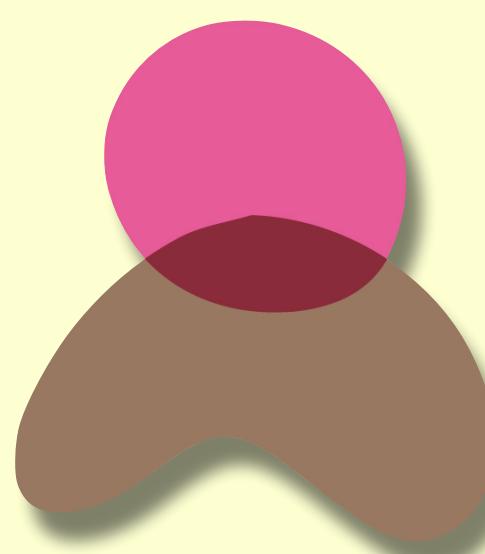
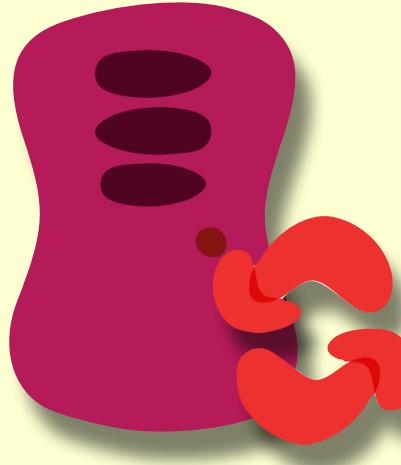
Penultima ↑ e



2.

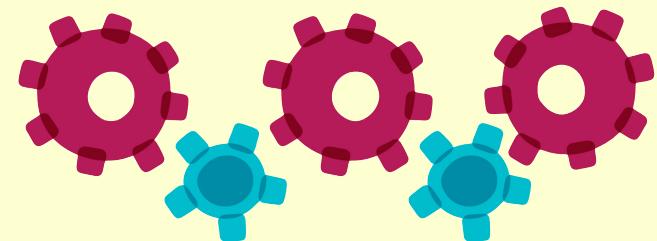
Penultima ↑ e

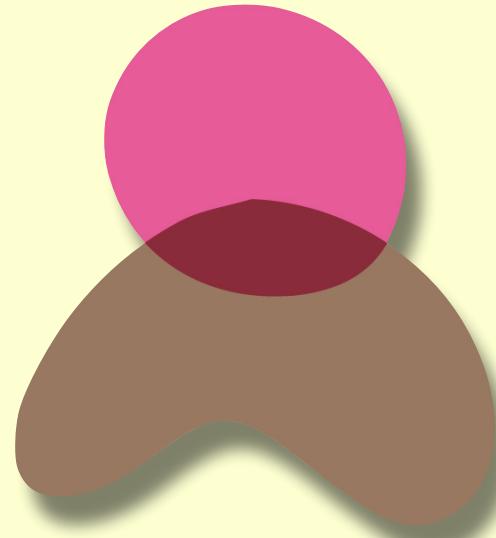
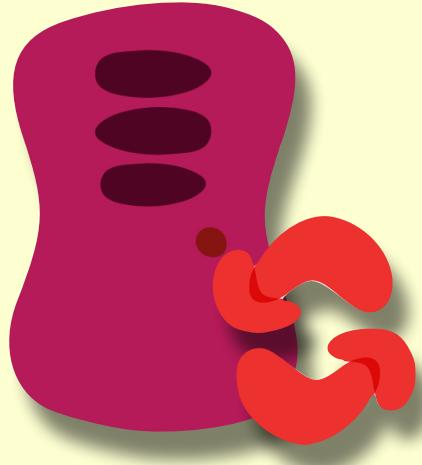




too complex!!

Penultimate ↑ e

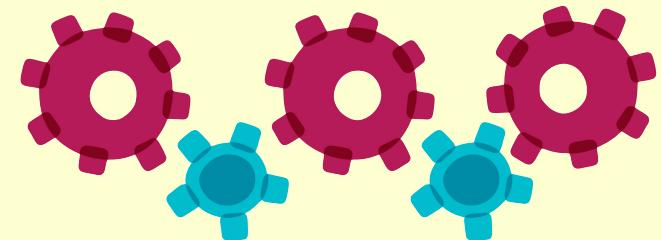


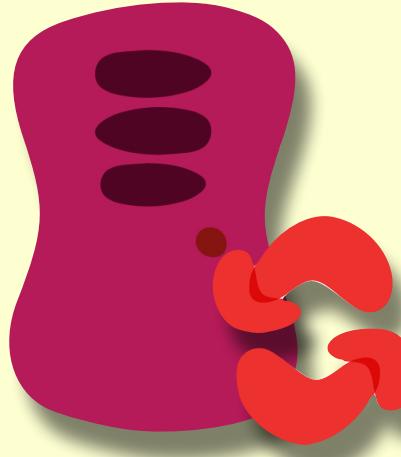


Penultimate ↑ e

too complex!!

no expertise!!

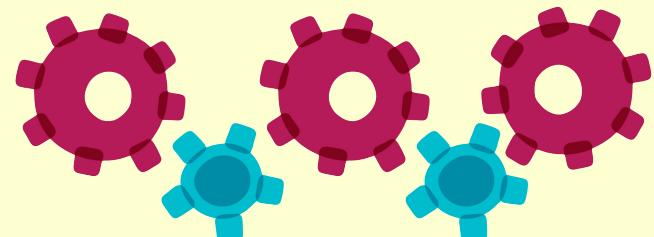




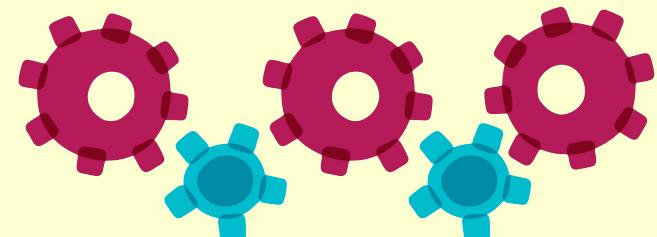
too complex!!

no expertise!!

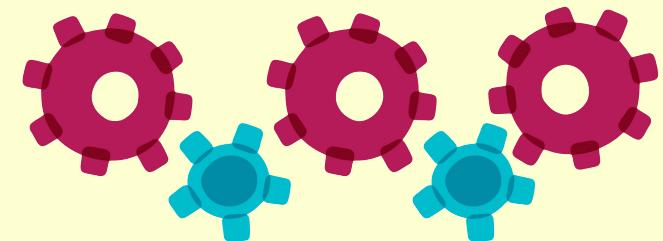
where to start?!!



Penultimate ↑ e



Penultimate ↑

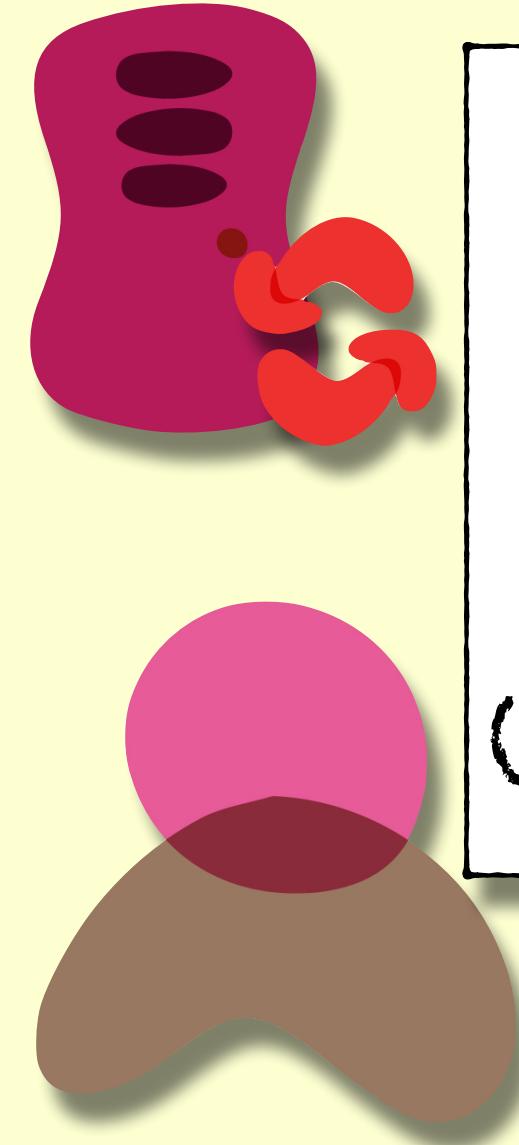
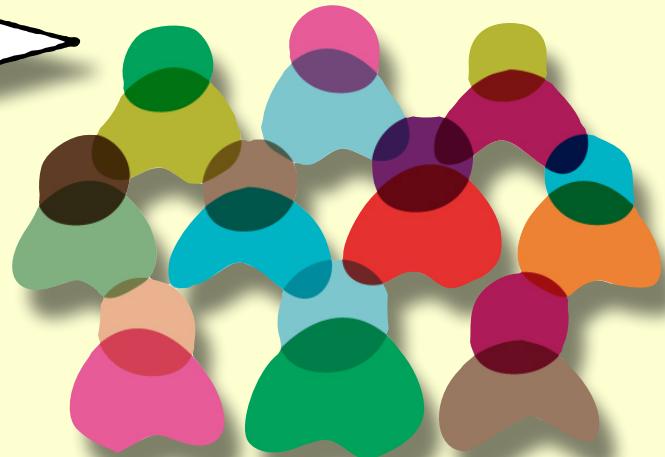


too complex!!

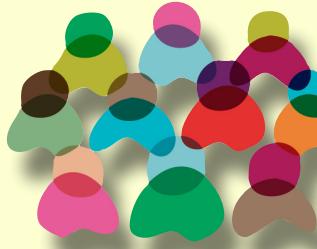
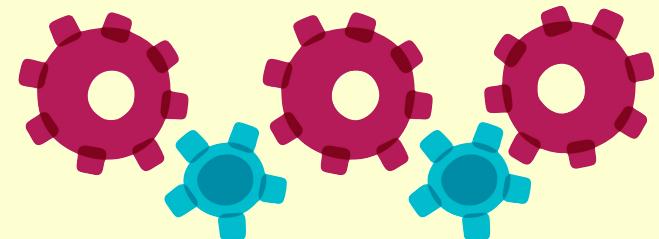
no expertise!!

where to start?!!

(it'll never work)



Penultimate ↑



too complex!!

no expertise!!

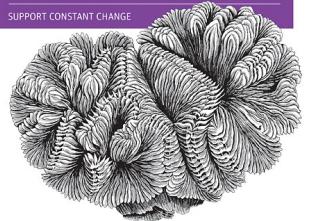
where to start?!!

(it'll never work)

O'REILLY®

Building Evolutionary Architectures

SUPPORT CONSTANT CHANGE

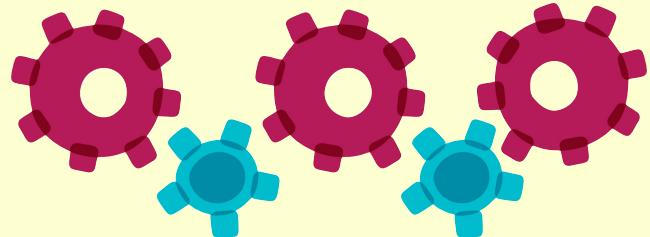


Neal Ford, Rebecca Parsons & Patrick Kua

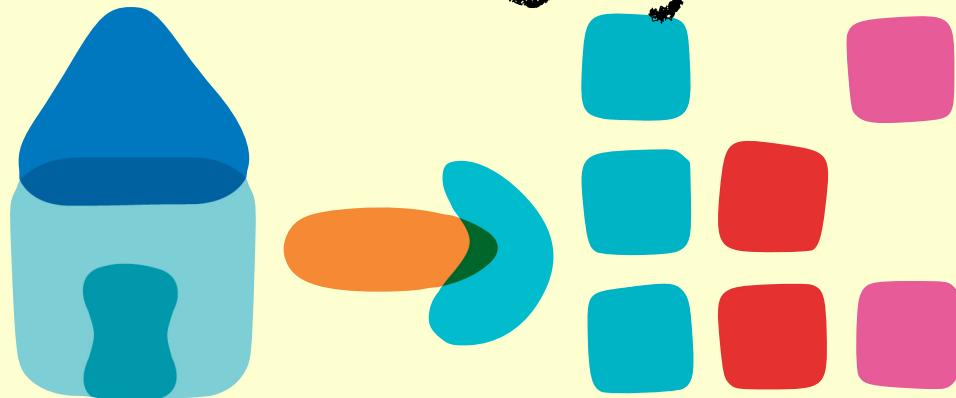
Neal Ford, Rebecca Parsons & Patrick Kua

demonstration
defeats
discussion

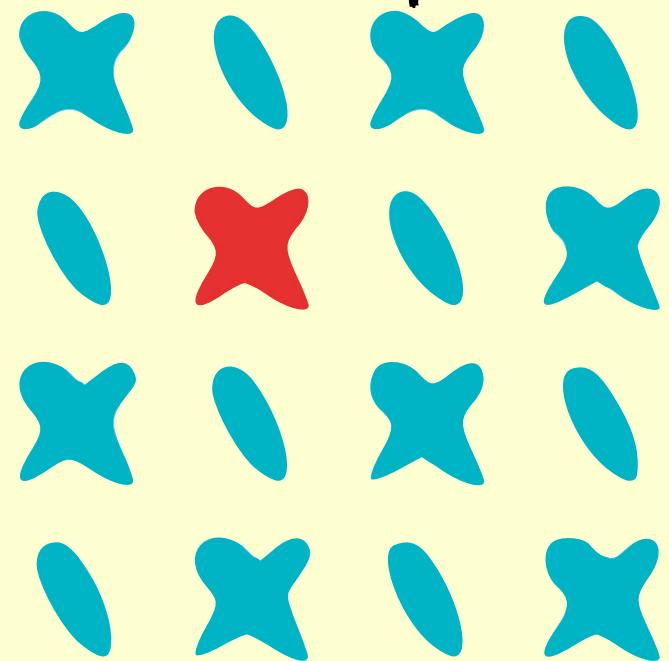
Penultima↑e

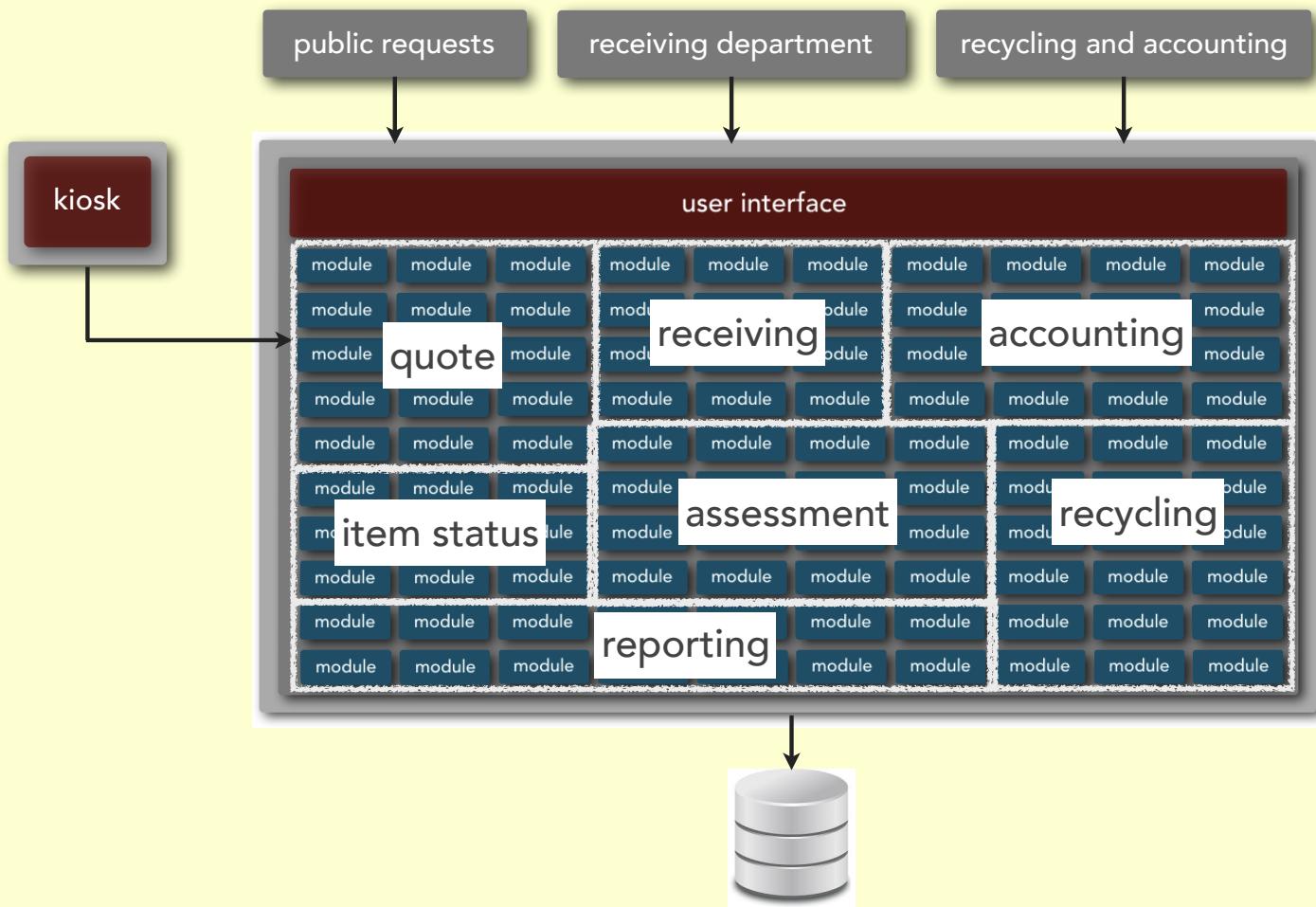


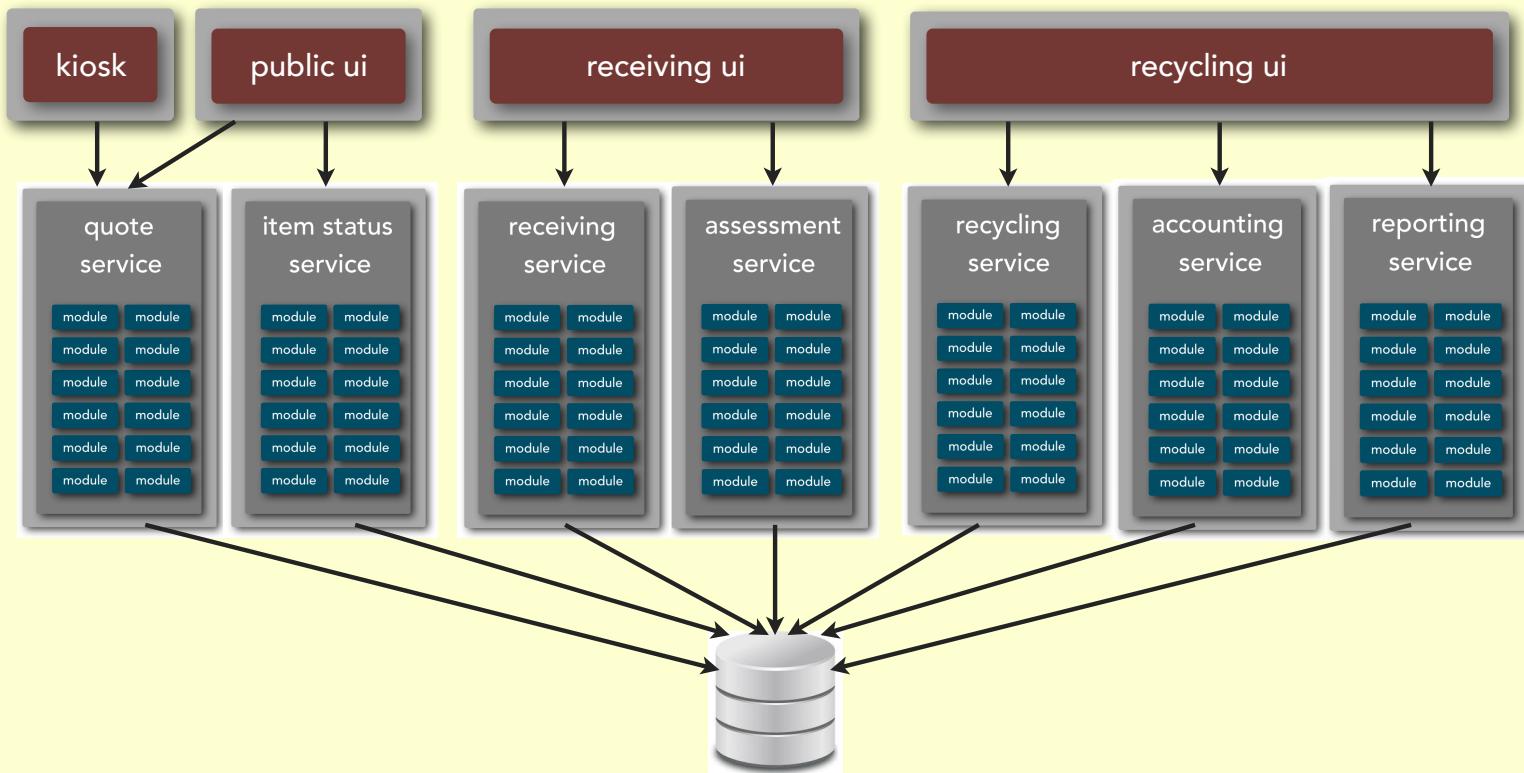
migrate critical
existing systems

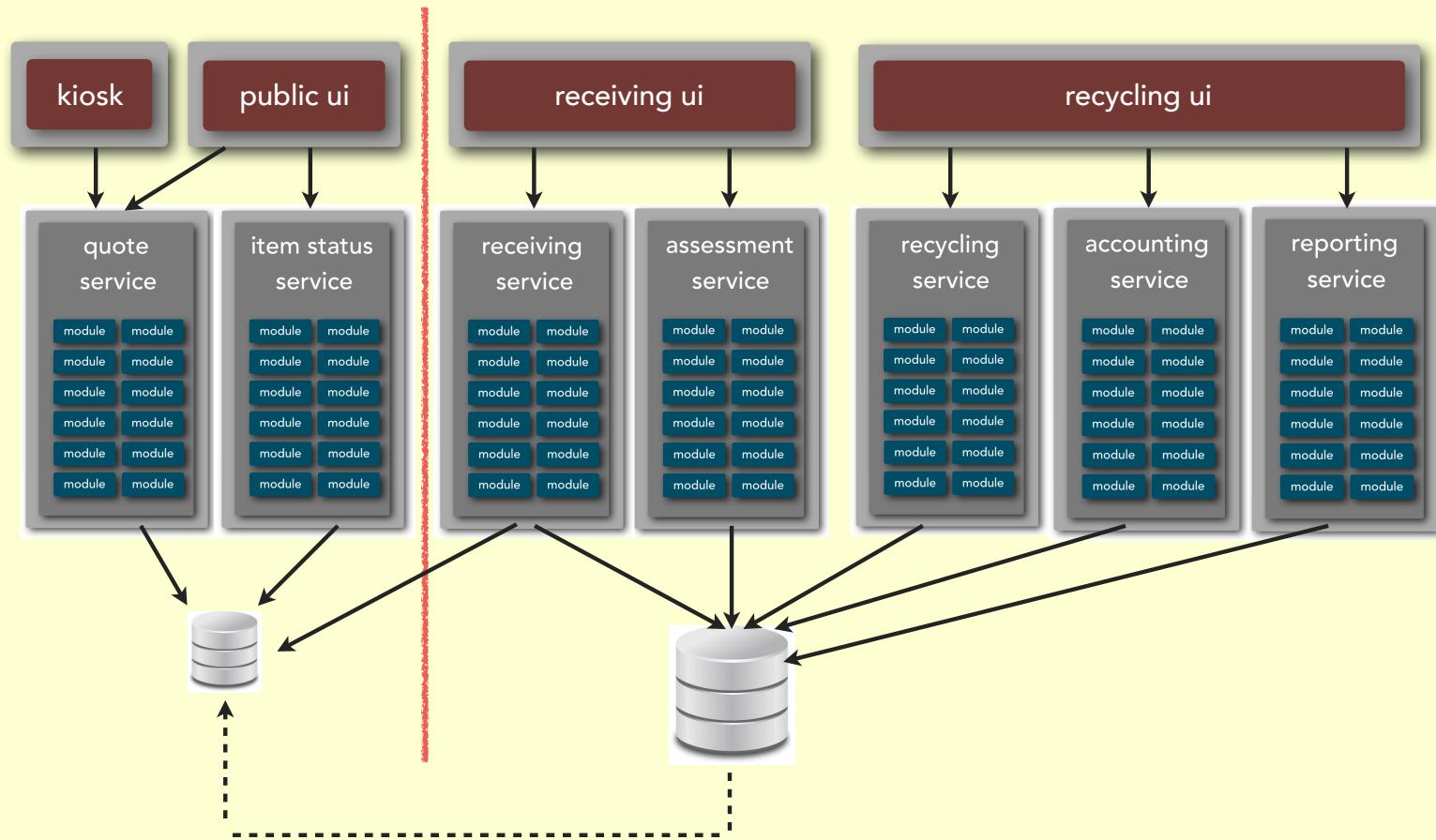


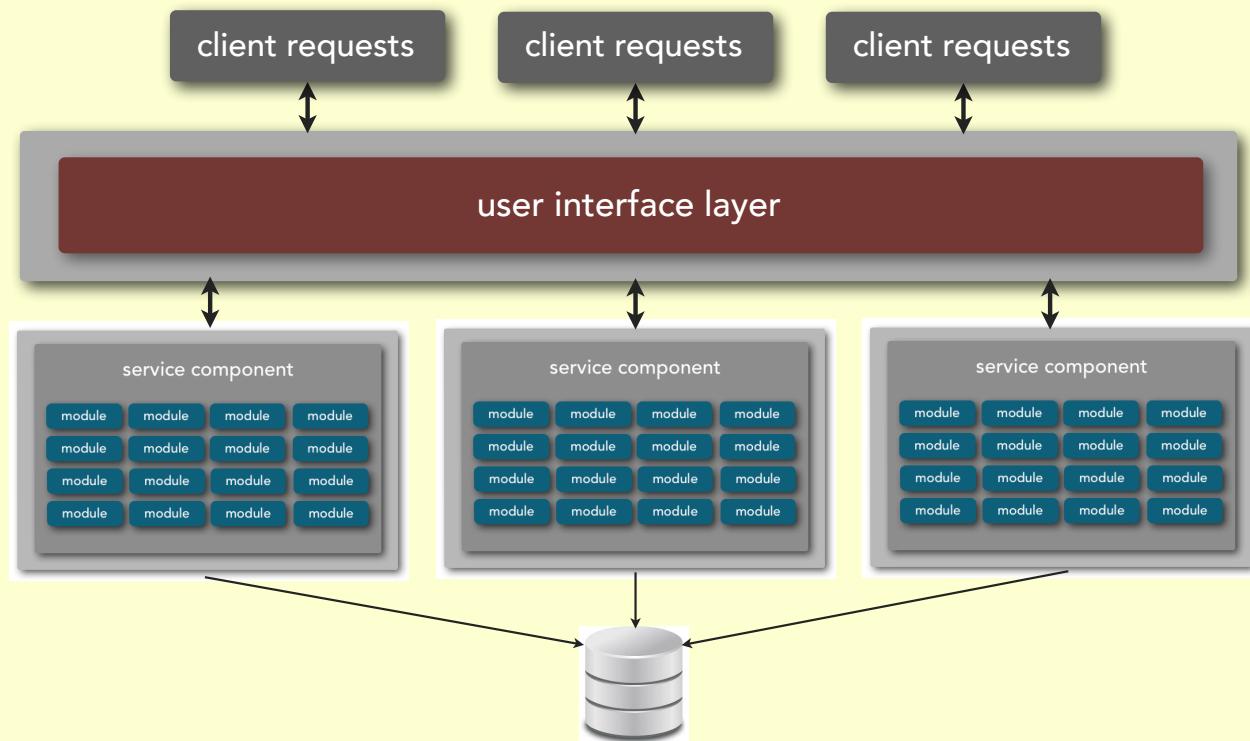
microservices for
new development

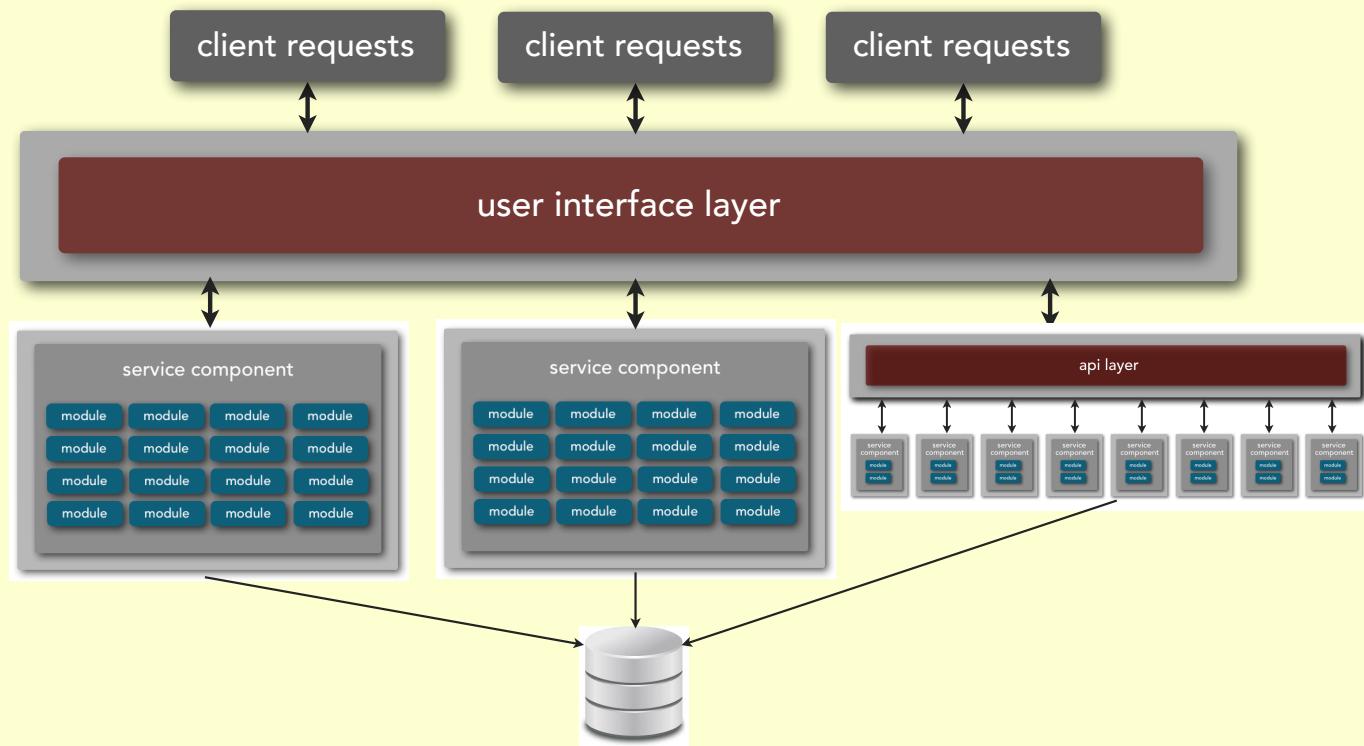


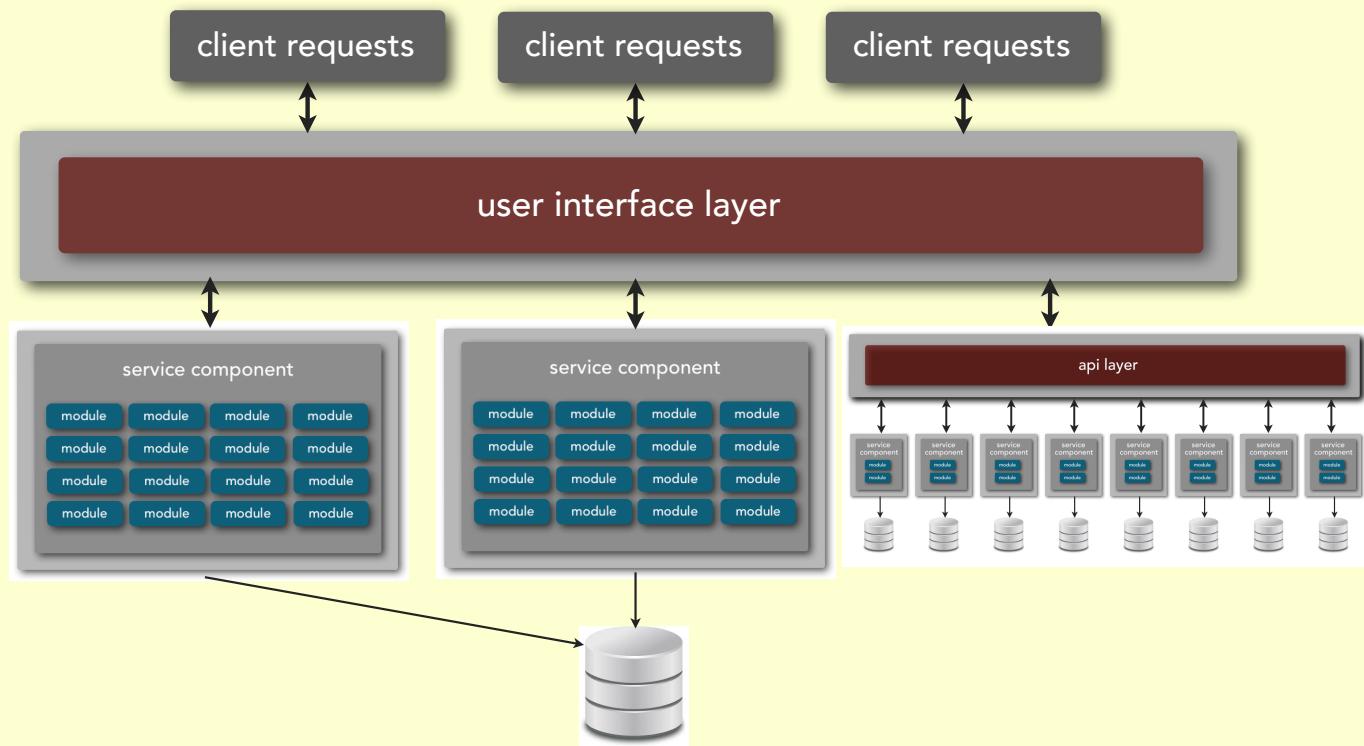




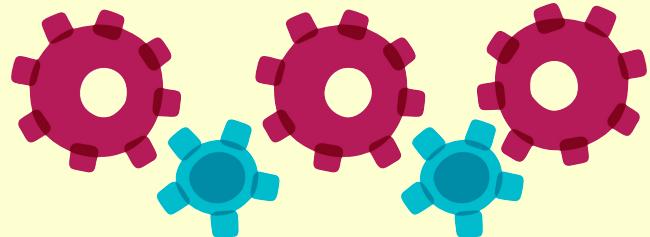




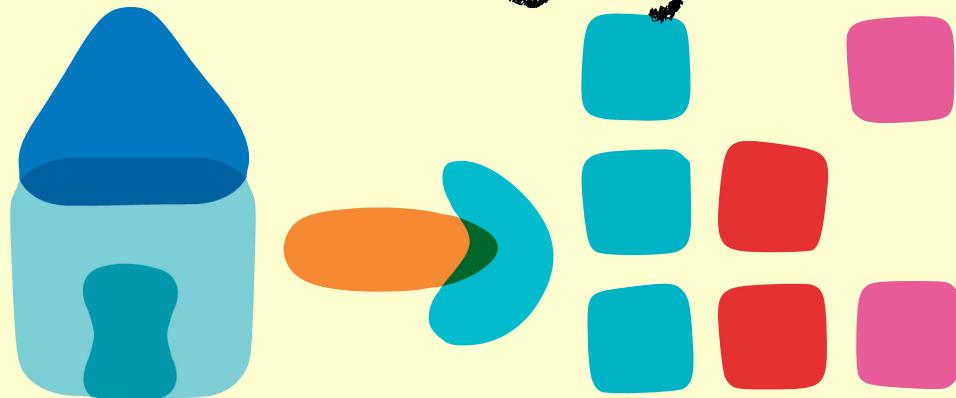




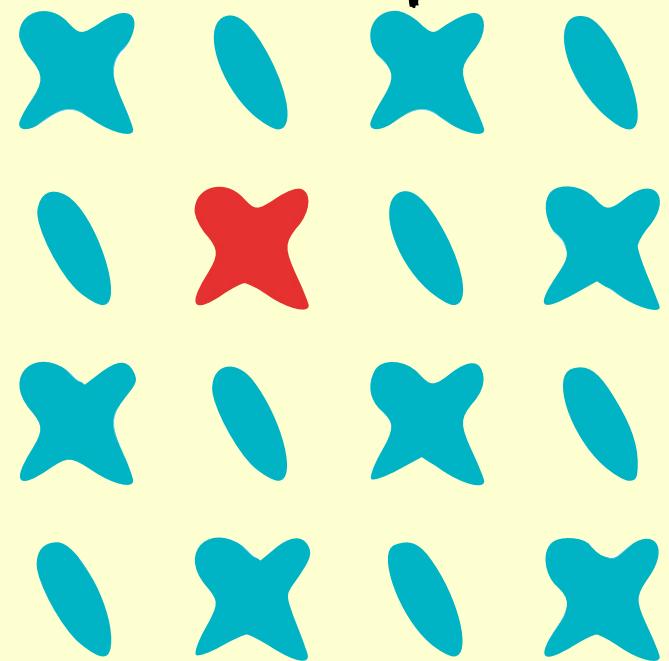
Penultima↑e



migrate critical
existing systems

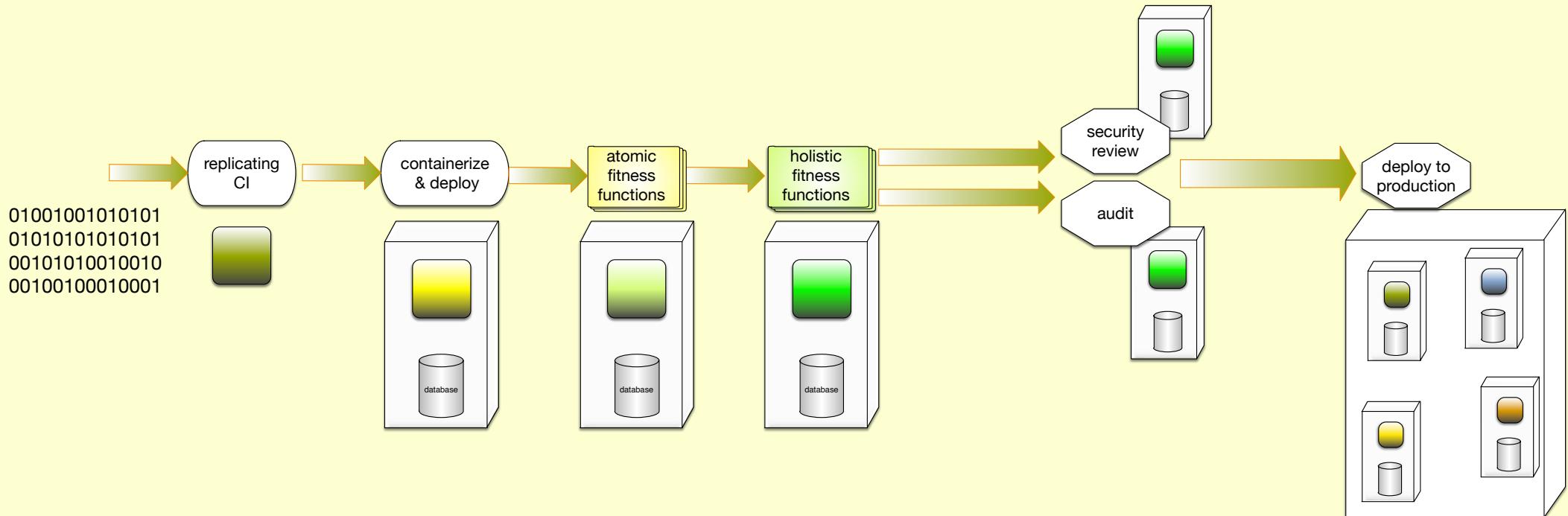


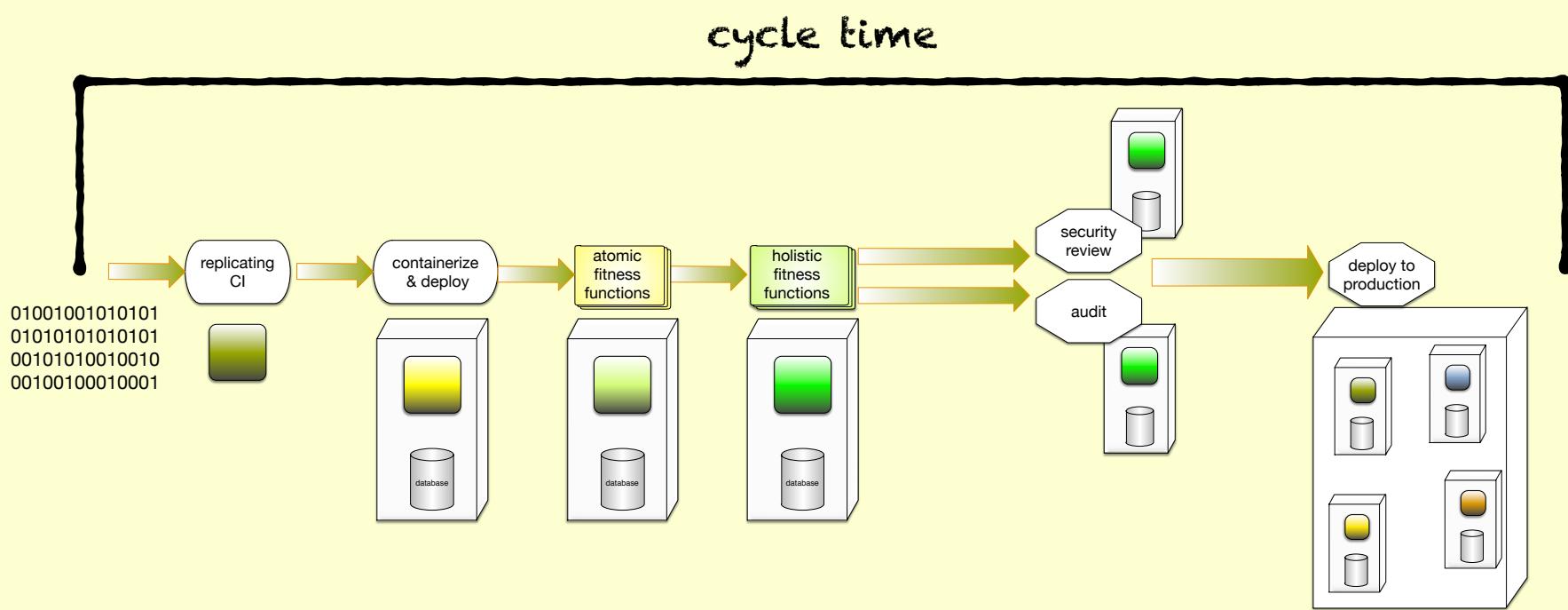
microservices for
new development

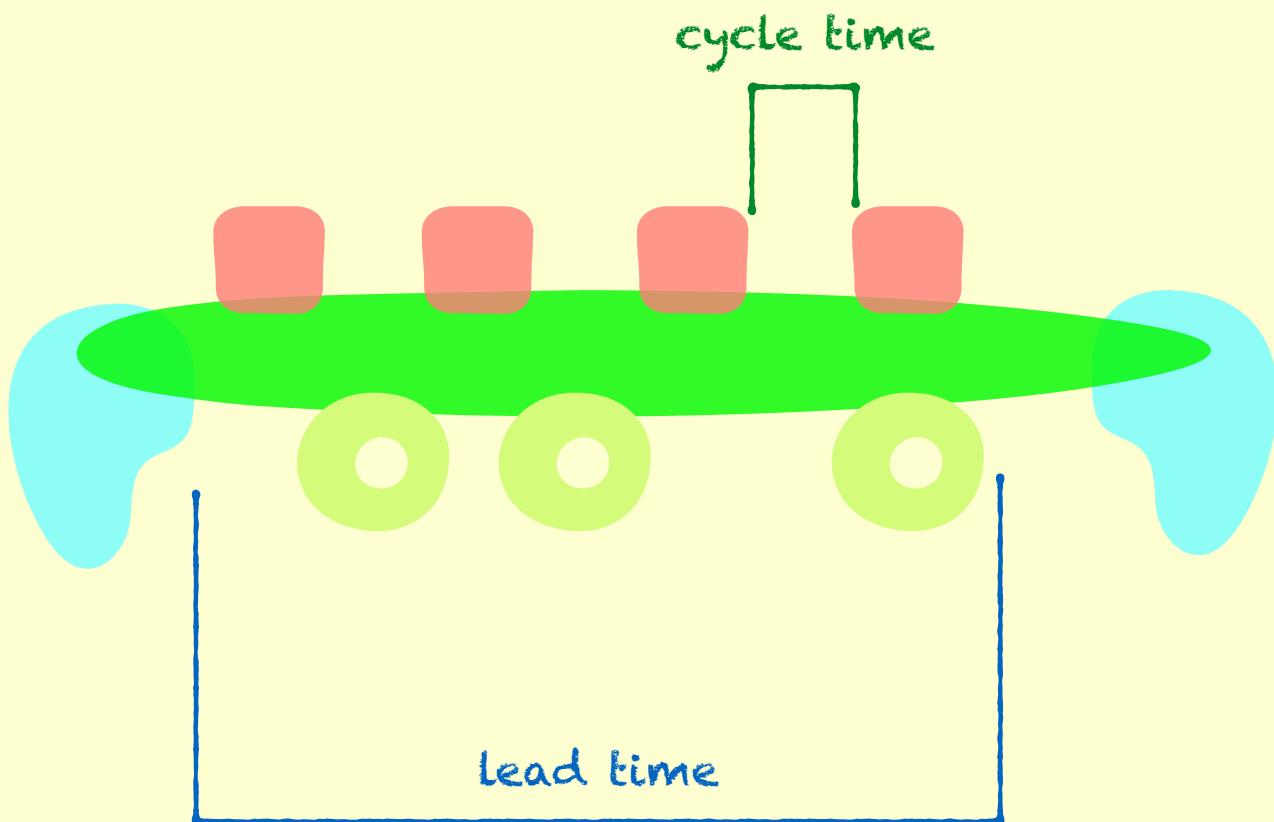




Deployment Pipeline









Penultimate[↑]e **fitness function:**

CycleTimeGuard

PenultimateWidgets has entered an extremely competitive market, with a startup running popular flash promotions. The marketing department has committed to keeping up with PenultimateWidgets own aggressive marketing campaign, which requires development teams to be able to deliver changes to the promotion pages within an hour. Thus, they want a guarantee that changes can always take place within an hour.

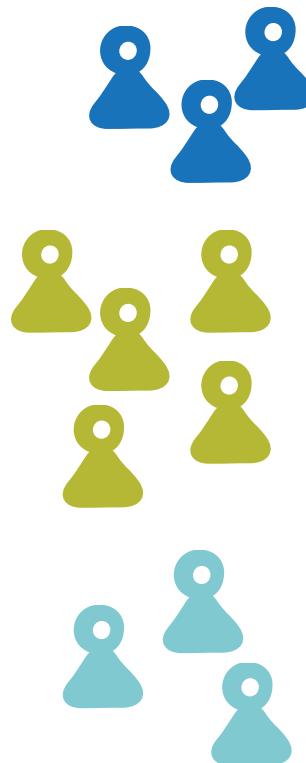


Penultimate ↑
fitness function:

CycleTimeGuard

- utilize the good modularity of the monolith to build a deployment pipeline that automatically incorporates CMS changes
- continuously deploy new content for marketing pages as long as they pass smoke test
- measure cycle time from deployment pipeline for deployments for marketing sites
- save cycle time results to aggregate a weekly chart

Incidentally Coupled Teams



user interface

server-side

DBA

Conway's Law

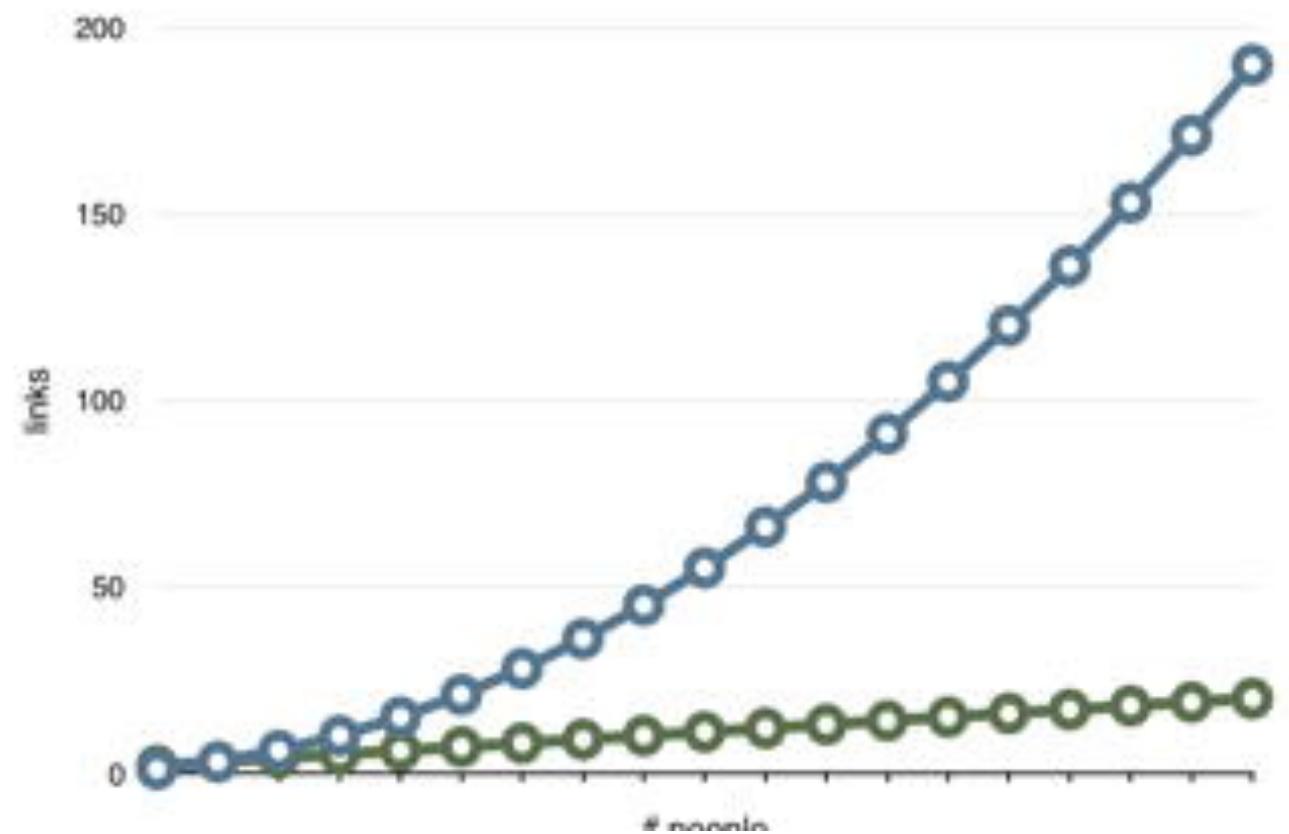
“organizations which design systems ... are constrained to produce designs which are copies of the communication structures of these organizations”

Melvin Conway, 1968

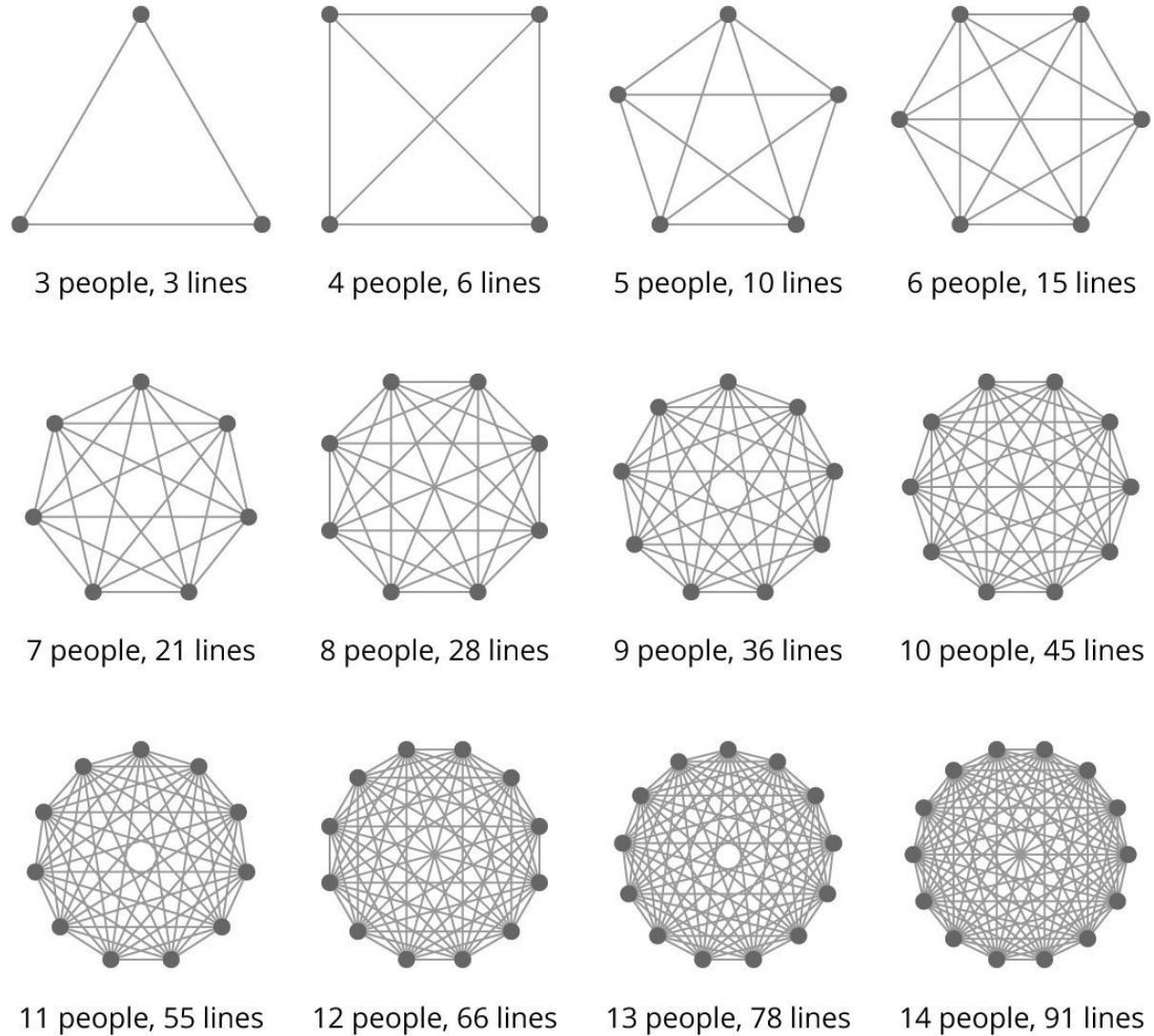
en.wikipedia.org/wiki/Conway%27s_law

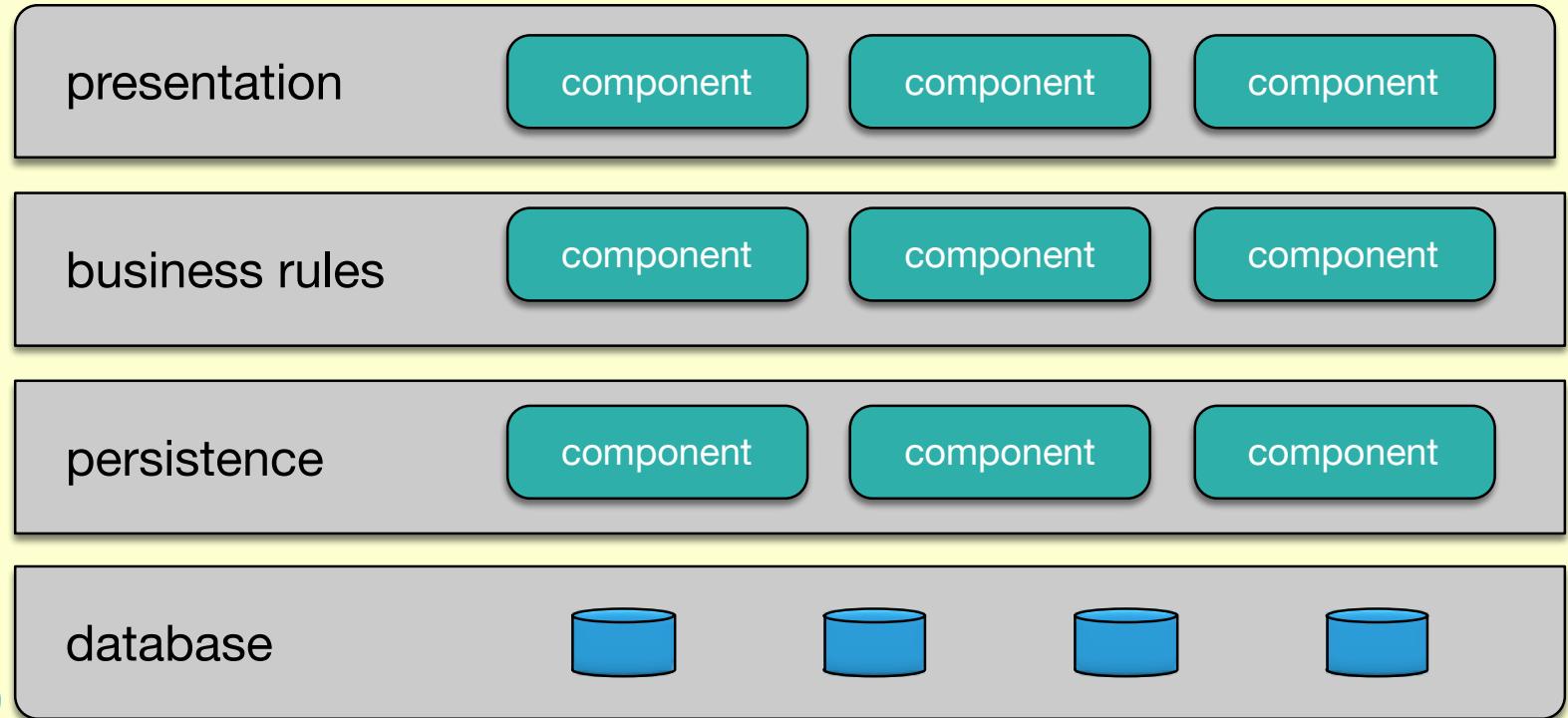
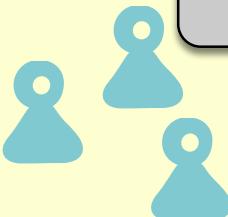
Low Efferent Coupling between Teams

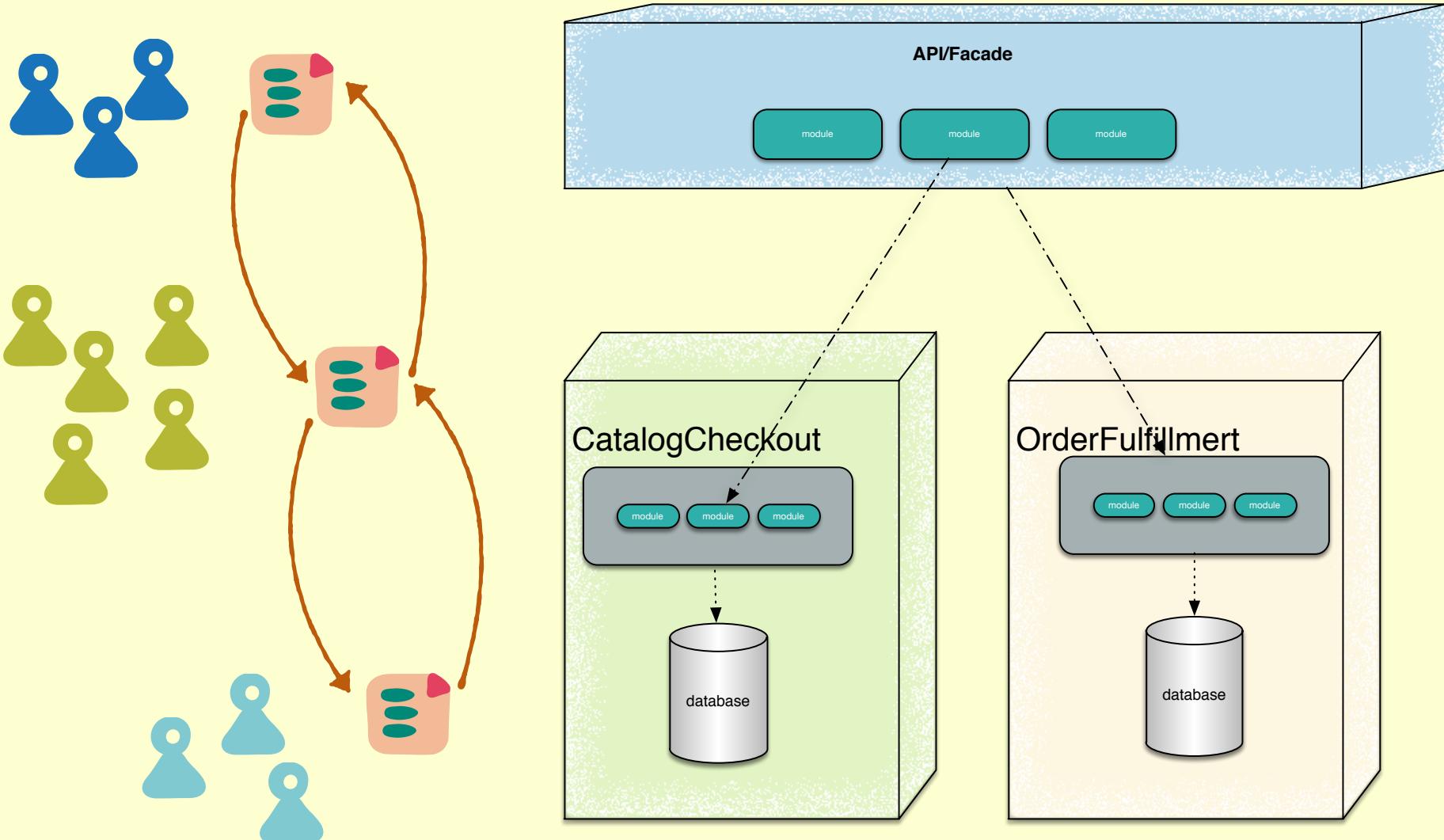
$$\frac{n(n-1)}{2}$$

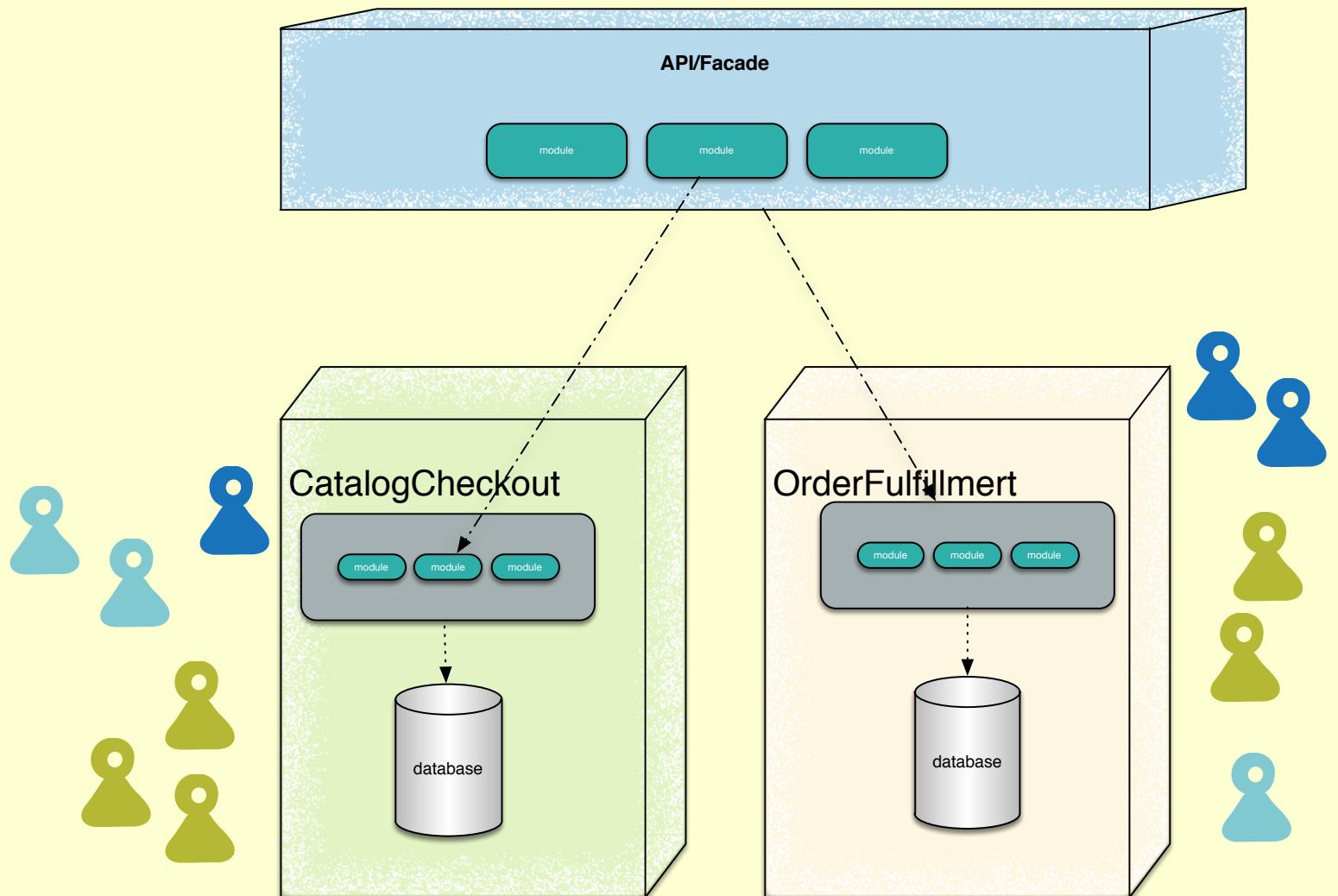


Low Efferent Coupling between Teams





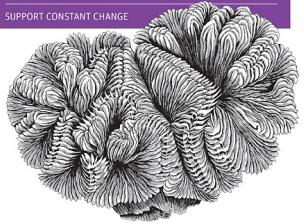




O'REILLY®

Building Evolutionary Architectures

SUPPORT CONSTANT CHANGE



Neal Ford, Rebecca Parsons & Patrick Kua

Neal Ford, Rebecca Parsons & Patrick Kua

Experimentation is the only way to discover if something works within a particular organization.



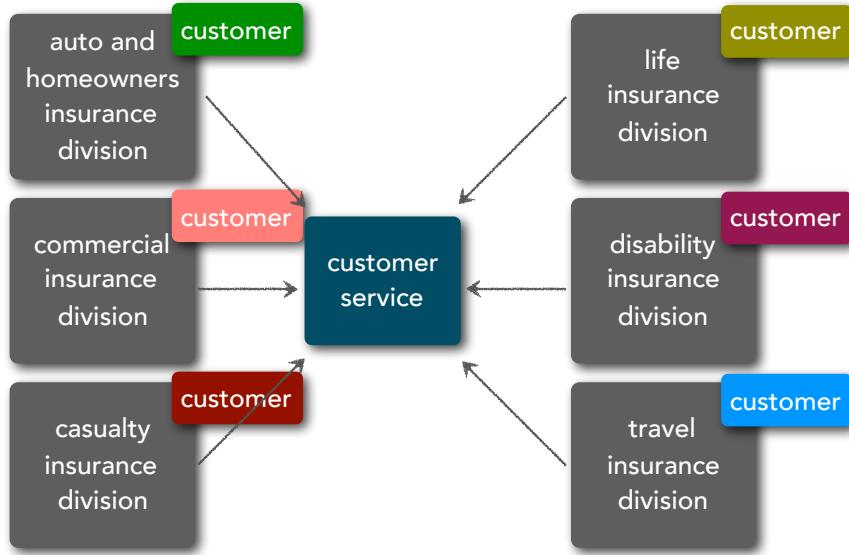
reuse



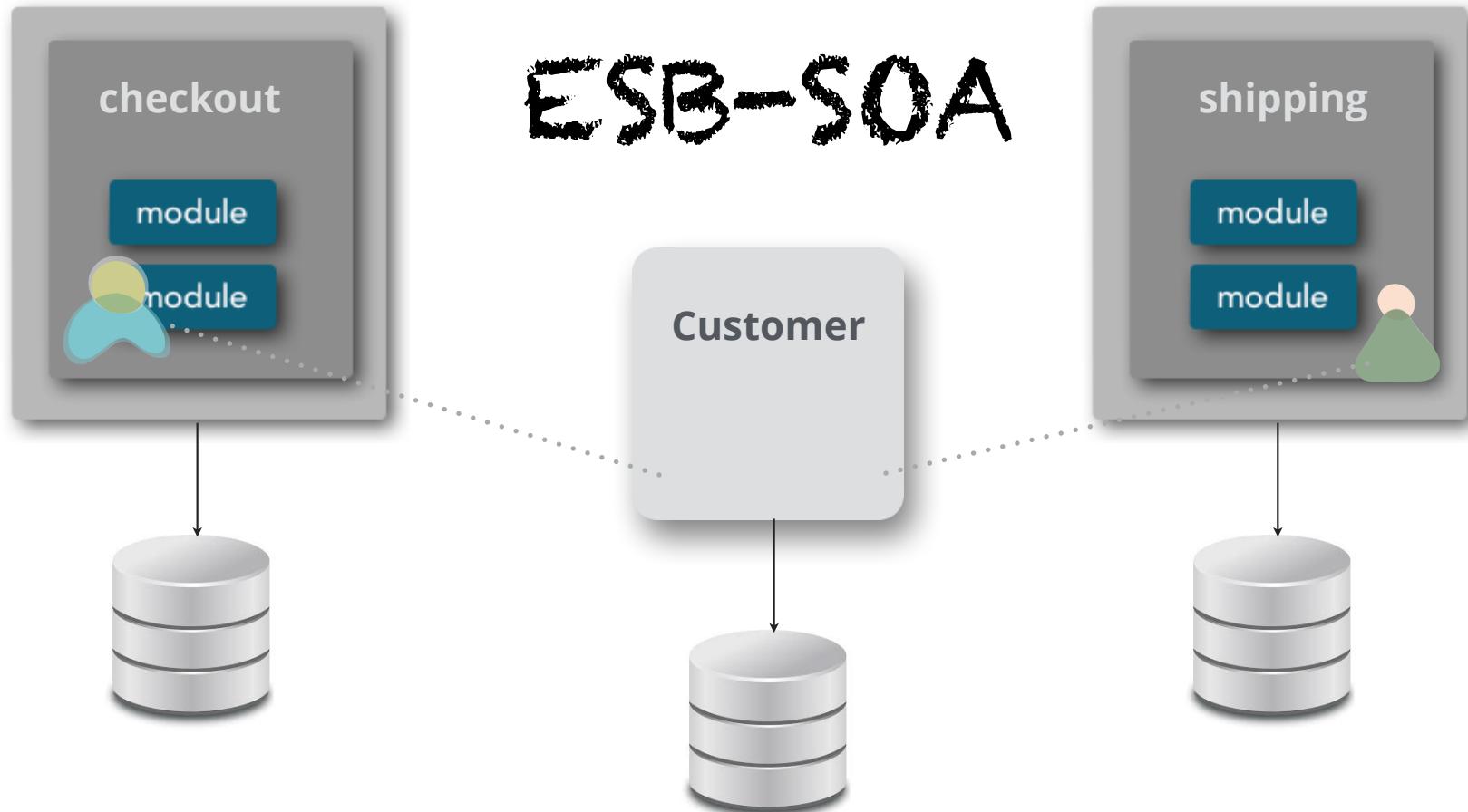
Software reuse is more
like an organ
transplant than
snapping together Lego
blocks.

John D. Cook

<http://www.johndcook.com/blog/2011/02/03/lego-blocks-and-organ-transplants/>



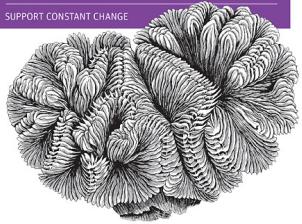
Code Reuse (Over Time)



O'REILLY®

Building Evolutionary Architectures

SUPPORT CONSTANT CHANGE

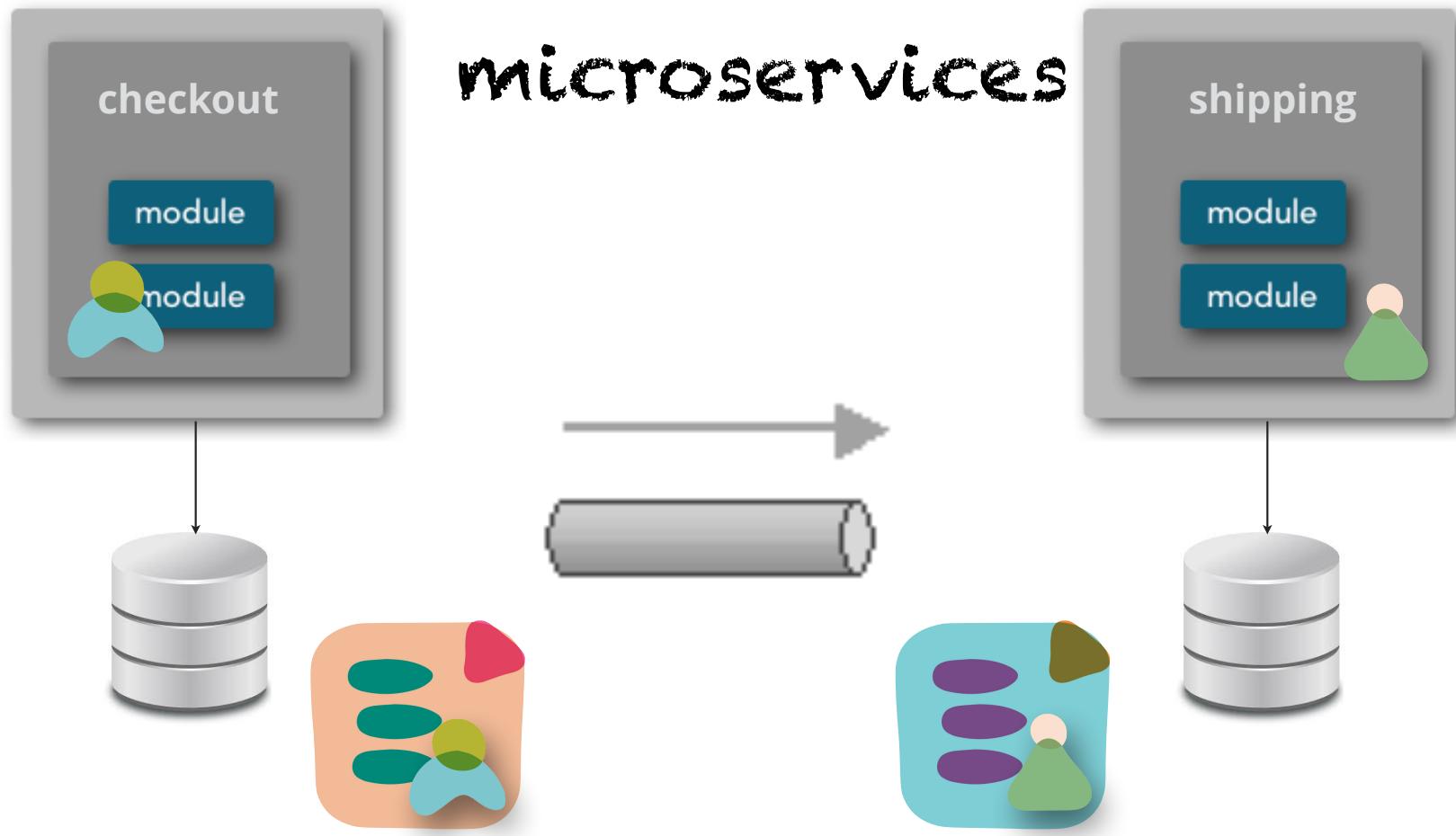


Neal Ford, Rebecca Parsons & Patrick Kua

Neal Ford, Rebecca Parsons & Patrick Kua

The more reusable code
is, the less usable it is.

Code Reuse (Over Time)

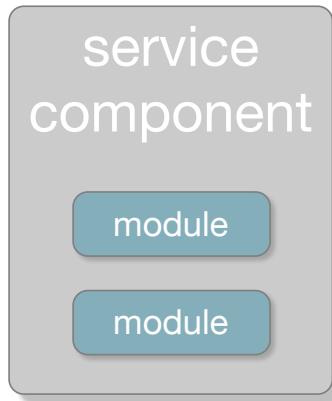


service
component

module

module

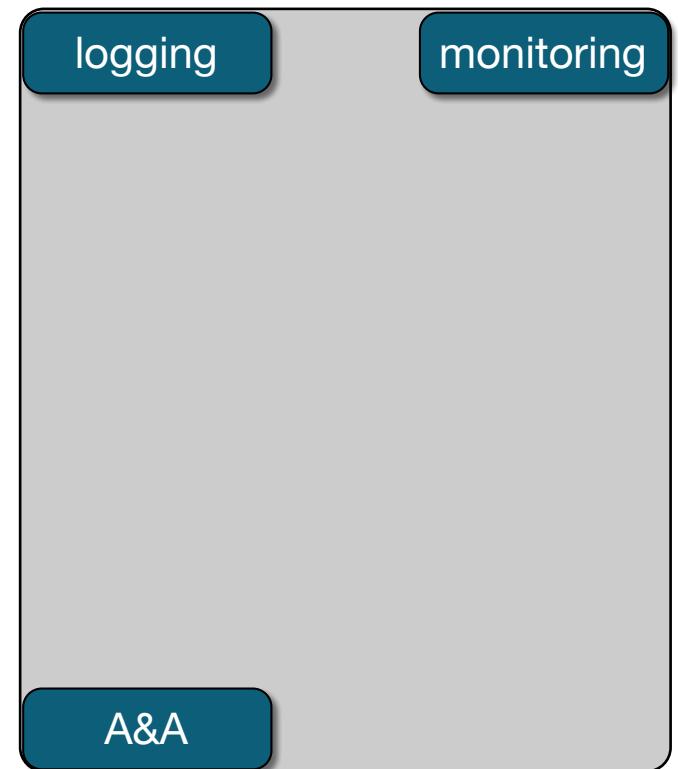
service templates



<https://projects.spring.io/spring-boot/>



<http://www.dropwizard.io/>



the rise of service meshes

Phil Calçado

Microservices Patterns About

Pattern: Service Mesh

Aug 3, 2017

Microservices • Distributed Systems • Service Mesh • Patterns •

Since their first introduction many decades ago, we learnt that distributed systems enable use cases we couldn't even think about before them, but they also introduce all sorts of new issues.

When these systems were rare and simple, engineers dealt with the added complexity by minimising the number of remote interactions. The safest way to handle distribution has been to avoid it as much as possible, even if that meant duplicated logic and data across various systems.

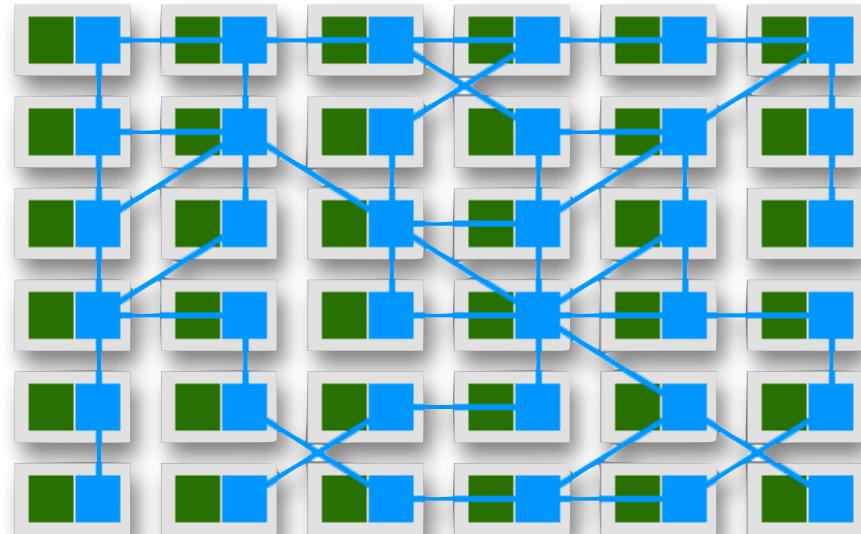
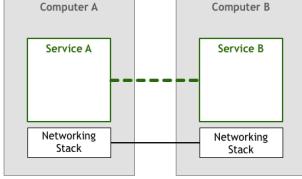
But our needs as an industry pushed us even further, from a few larger central computers to hundreds and thousands of small services. In this new world, we've had to start taking our head out of the sand and tackling the new challenges and open questions, first with ad-hoc solutions done in a case-by-case manner and subsequently with something more sophisticated. As we find out more about the problem domain and design better solutions, we start crystallising some of the most common needs into patterns, libraries, and eventually platforms.

What happened when we first started networking computers

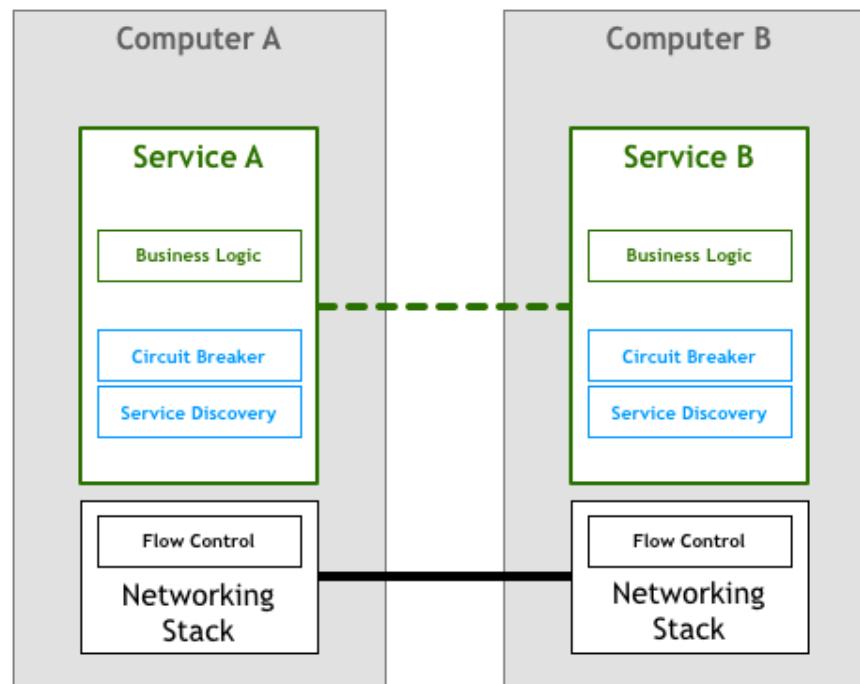
Since people first thought about getting two or more computers to talk to each other, they envisioned something like this:



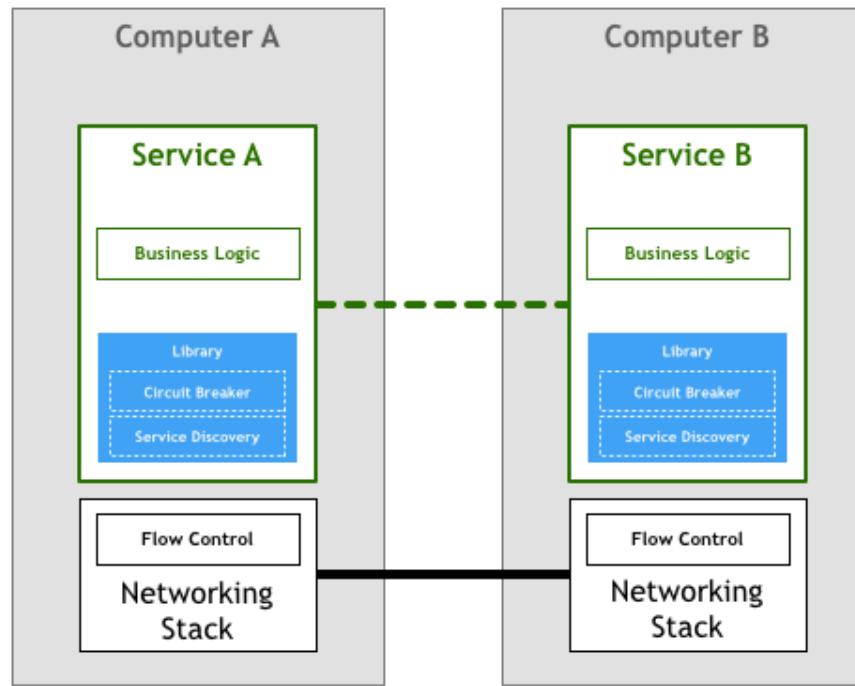
A service talks to another to accomplish some goal for an end-user. This is an obviously oversimplified view, as the many layers that translate between the bytes your code manipulates and the electric signals that are sent and received over a wire are missing. The abstraction is sufficient for our discussion, though. Let's just add a bit more detail by showing the networking stack as a distinct component:



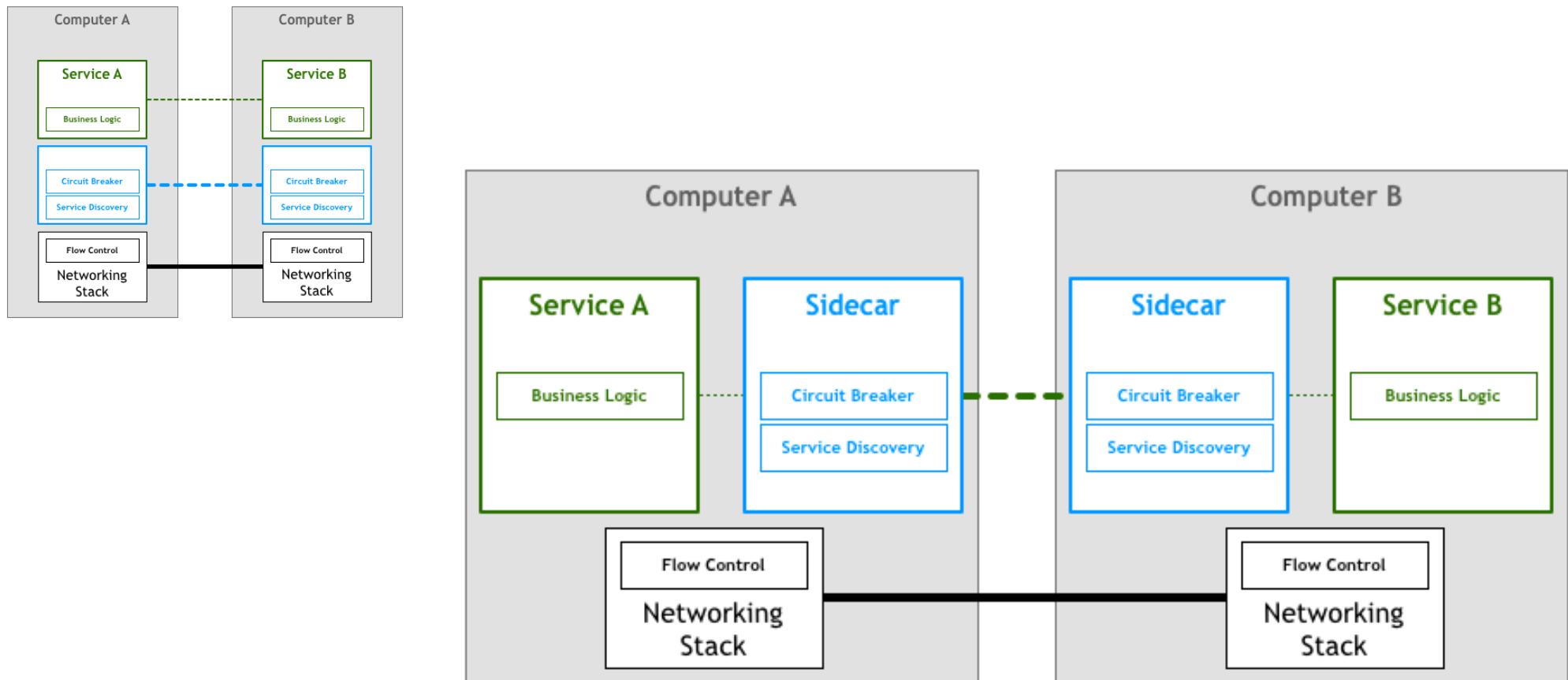
the rise of service meshes



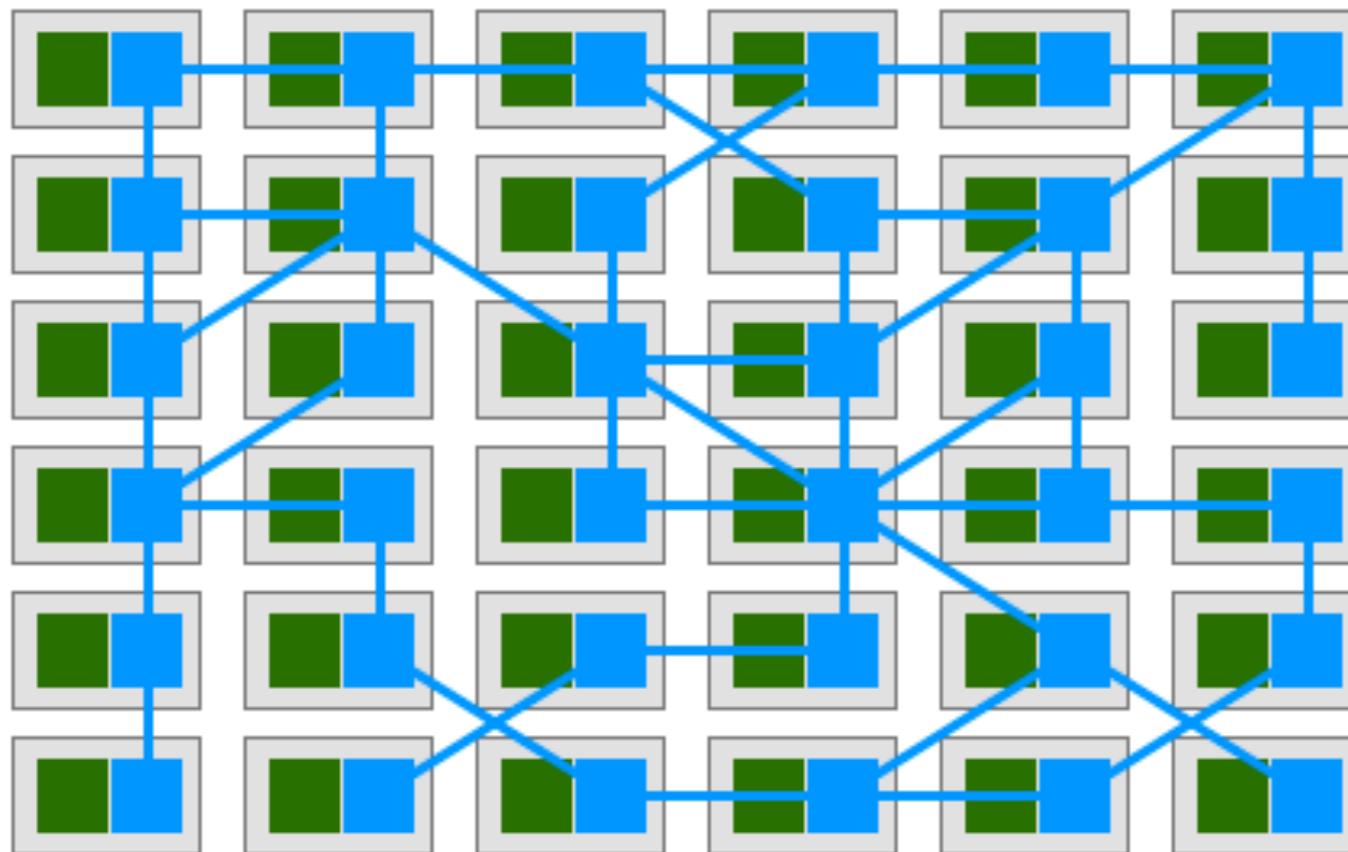
the rise of service meshes



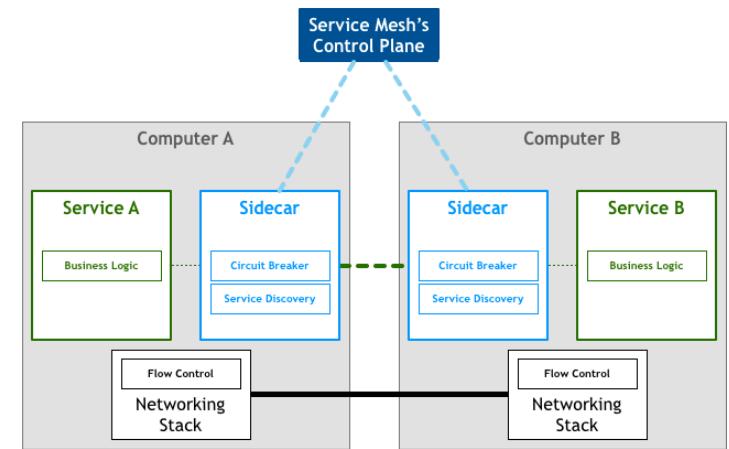
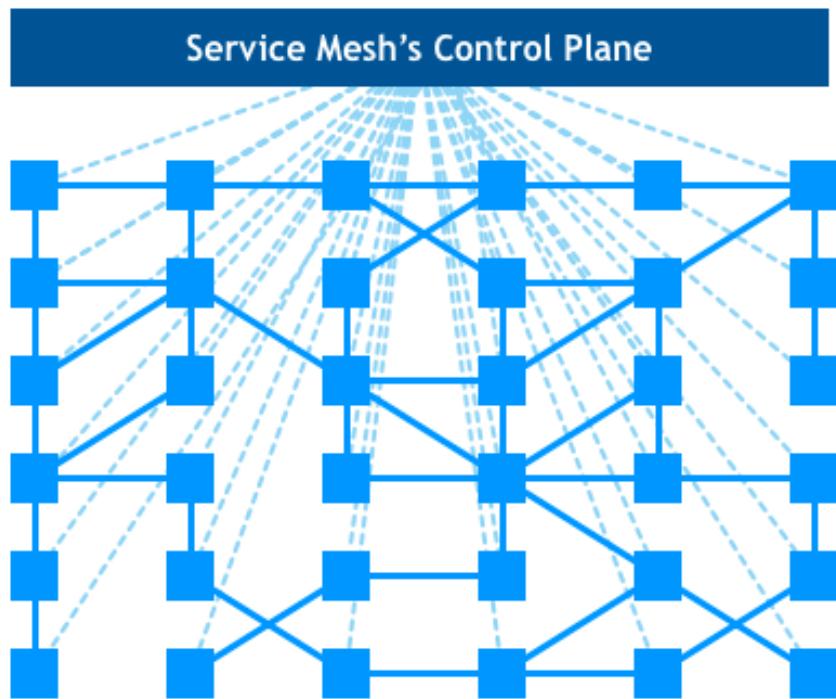
the rise of service meshes



the rise of service meshes



the rise of service meshes





PenultimateWidgets

fitness function: Elasticity of Microservices

PenultimateWidgets utilizes a microservices architecture and want to ensure that as new requests appear that the architecture elastically scales.



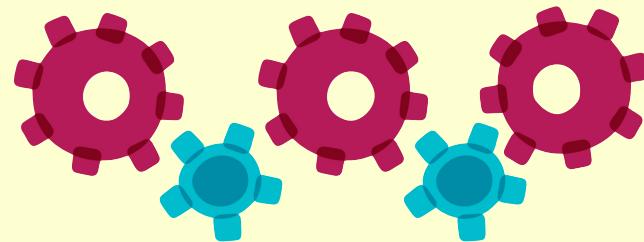
Penultima ↑e **fitness function:**

Elasticity of Microservices

- build a Hello, World service to allow instantiation of the service template
- deploy the service and direct enough requests to it to trigger elasticity in the naming service
- verify that the number of instances rose properly

Retrofitting Governance

Penultima ↑ e





Penultimate[↑]e fitness function:

Configure Some of the Things All of the Time

PenultimateWidgets has been burned in the past by having hard-coded constants in several places in their code base, governing both business cases (thresholds, maximums, etc.) and operational concerns. Architects need a way to prevent developers from accidentally hard-coding critical values.



fitness function:

Configure Some of the Things All of the Time

- Upon check-in:
 - scan the list of dynamic values in the code base and see if any of them are assigned to (or their setter is called) or a new instance is instantiated via a constructor that provides values
 - ensure that all assignments for dynamic values are assigned via the API that handles configuration, not with hard-coded values
 - scan the definitions of infrastructure to look for dynamic values and ensure they are assigned properly before building the environment
 - scan the configuration file and ensure that all defined dynamic values are present and have values



Penultimate [↑]e fitness function:

Audit the Accounting

PenultimateWidgets has been a Bad Company (cheating on some complex accounting rules), but they have reformed their ways and paid their penalties. Now, however, as part of the settlement, they agree to put auditing measures in place around code that handles accounting rules. State auditors come once a quarter to look everything over, but PenultimateWidgets has found it too much of a chore to delay preparation until near audit time; they want a more automated way to verify things.



fitness function:

Audit the Accounting

- During check-in, look at git logs to see if any files in the affected packages were modified
- for any modified file, add it to a database of files to check by the auditors
- the tech lead code reviews changes for the last week before standup
- at audit time, show each of the changed files to auditors and allow them access to the repository to verify that no other files were changed



Penultimate **fitness function:**

Debug All the Things

PenultimateWidgets wants to ensure that both Java and Javascript applications support remote debugging in the development environment to aid in faster customer support resolution.

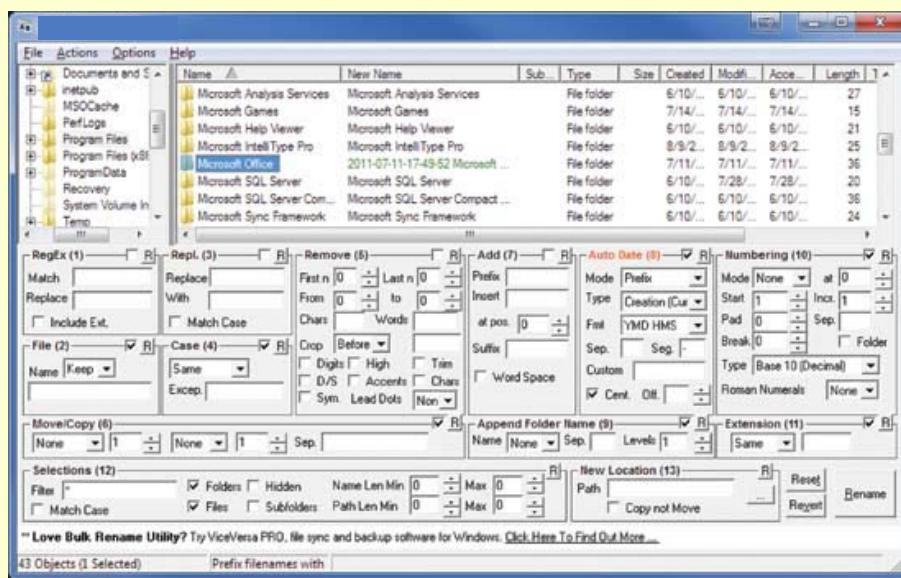


Penultimate ↑e **fitness function:**

Debug All the Things

- for Java applications, create a monitor that runs in development and QA that checks to ensure the remote debugging ports are available and listening for all deployed Java applications
- create a symmetrical monitor for production systems to ensure the remote debugging ports are NOT enabled in production
- For Javascript, create a special flag variable declaration at the top of the file that is not used anywhere else (meaning the minimizer will remove it). For development and QA environments, check to make sure the special flag variable is present
- include source maps for obfuscated code to map problems back to the source

What to Port?

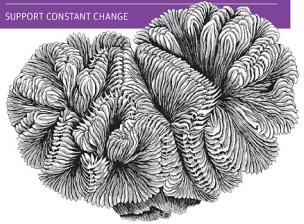


Cash Flow											
	April	May	June	July	August	September	October	November	December	January	February
CASH ON HAND Beginning of the month	33,490.00	37,370.00	30,550.00	51,730.00	41,510.00	53,190.00	47,970.00	38,610.00			
INCOME	21,500.00	11,500.00	39,500.00	8,500.00	30,000.00	13,500.00	9,000.00	34,500.00			
CONSULTING	4,000.00	5,000.00	19,000.00	4,000.00	25,000.00	4,000.00	4,000.00	5,000.00			
Microsoft	4,000.00	5,000.00	4,000.00	4,000.00	5,000.00	4,000.00	4,000.00	5,000.00			
The Wall Street Journal			15,000.00		20,000.00						
Interface Design & Development			15,000.00		20,000.00						
PRODUCTS	4,500.00	5,000.00	4,500.00	4,500.00	5,000.00	4,500.00	5,000.00	4,500.00			
Merchandise	2,000.00	2,500.00	2,000.00	2,000.00	2,500.00	2,000.00	2,500.00	2,000.00			
Web Applications	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00			
SERVICES	13,000.00	1,500.00	16,000.00						5,000.00	25,000.00	
EXPENSES	17,620.00	18,320.00	18,320.00	18,720.00	18,320.00	18,720.00	18,320.00	18,720.00			
Foxnews.com	500.00										
Microsoft	400.00	1,600.00	1,600.00	2,000.00	1,600.00	2,000.00	1,600.00	1,600.00			
Brand Consulting	400.00	1,600.00	1,600.00	2,000.00	1,600.00	2,000.00	1,600.00	1,600.00			
Web Applications	600.00	600.00	600.00	600.00	600.00	600.00	600.00	600.00			
INTERNET/TELECOMMUNICATIONS	420.00	420.00	420.00	420.00	420.00	420.00	420.00	420.00			
PAYROLL	14,500.00	14,500.00	14,500.00	14,500.00	14,500.00	14,500.00	14,500.00	14,500.00			
RENT	1,200.00	1,200.00	1,200.00	1,200.00	1,200.00	1,200.00	1,200.00	1,200.00			
Office Space	1,200.00	1,200.00	1,200.00	1,200.00	1,200.00	1,200.00	1,200.00	1,200.00			

O'REILLY®

Building Evolutionary Architectures

SUPPORT CONSTANT CHANGE

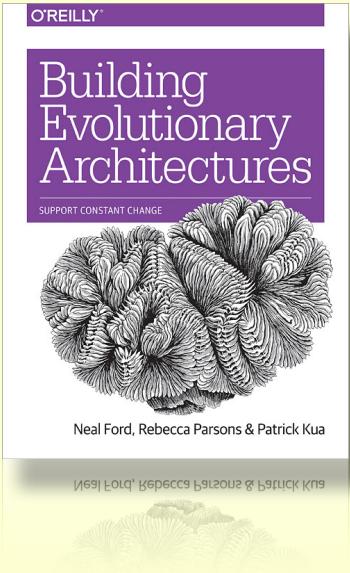


Neal Ford, Rebecca Parsons & Patrick Kua

Neal Ford, Rebecca Parsons & Patrick Kua

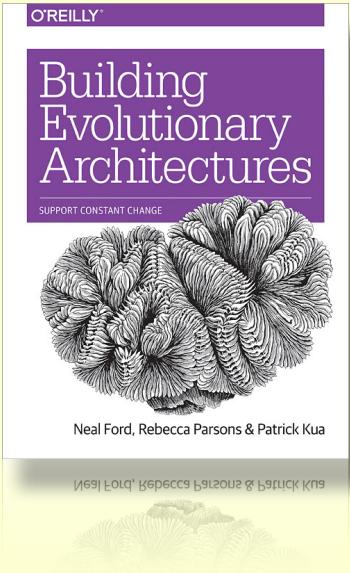
Experimentation!

- add logging to the existing application to aggregate what menu items users choose and the user group



Experimentation!

- add logging to the existing application to aggregate what menu items users choose and the user group
- publish the log to a known URL at PenultimateWidgets



Experimentation!

- add logging to the existing application to aggregate what menu items users choose and the user group
- publish the log to a known URL at PenultimateWidgets
- aggregate the logs to get usage and user coverage



Penultimate [↑]e fitness function:

Make Sure New Really Replaces Old

PenultimateWidgets legacy accounting system grew over many years, with arcane business rules scattered in many places--no one really understands how everything works anymore. They have been working for several years on replacing the accounting system, but worry that the new system cannot replicate the byzantine business rules that their clients have come to depend upon.



Penultimate ↑
fitness function:

Make Sure New Really Replaces Old

- For each discrete function covered under this rule, create a functional test that treats each system (old and new) as a black box, looking only at the results of each.
- Provision the old system (perhaps using the Legacy in the Box pattern) and new in an integratino testing environment and run the functional replacement tests.
- Stories are not marked complete until the functional tests run.



Penultimate [↑] fitness function:

Replace the Crufty Core

PenultimateWidgets built a network scanning tool many, many years ago to look for suspicious activity at the network packet level. To achieve the proper performance, the code was written and has been maintained in increasingly complex C code.

PenultimateWidgets needs to replace the code but is nervous about introducing bugs and/or harming performance or throughput.



Penultimate ↑e fitness function:

Replace the Crufty Core

- Built fitness functions around the existing C code to ensure performance and throughput values.
- Build a spike solution in both Java and Go (and perhaps others) and run them against the fitness functions to see if they can meet the threshold
- Use Scientist (<https://github.com/github/scientist>) port Scientist4J (<https://github.com/rawls238/Scientist4J>) to verify the new code against the old code in production

While We're at it...



Penultimate [↑]e **fitness function:**

A11y All the Things

PenultimateWidgets has decided that all new development of user interfaces must support accessibility, both web and desktop.



Penultima[↑]e **fitness function:**

A11y All the Things

- add a fitness function to the deployment pipeline for web projects that runs pa11y (<http://pa11y.org/>) to ensure compliance
- for Java, use PMD to check code within the user interface and look for control instantiation
- check to make sure every control has the AccessibleName property set

Mitigating the Unknown



Penultimate ↑ e **fitness function:**

Deterministic Distributability

PenultimateWidgets has been burned in the past by hard-coded strings in applications that tie applications to a particular data center location. They want to ensure this doesn't happen in the future.



Penultima ↑e **fitness function:**

Deterministic Distributability

- Require that developers use configuration files for all database configuration (using tools like ArchUnit)
- During testing, randomly switch database configurations between tests across several working instances



Penultimate [↑]e **fitness function:**

Degrade Gracefully

PenultimateWidgets is proud of how popular their website has become and want to make sure the site performance degrades gracefully as scale increases.



Penultimate[↑]e

fitness function:

Maintaining Good Throughput

PenultimateWidgets is proud of how popular their website has become and want to make sure they maintain good throughput: a combination of performance and scalability.



Penultima[↑]e **fitness function:**

Degrade Gracefully

- build a run-time monitor that reports on number of instances, performance per instance and overall
- if performance or scalability violates the established thresholds, raise an alarm

Concrete Architecture Definitions

maintainable?

Concrete Architecture Definitions

maintainable?

Degrade gracefully versus Maintain Throughput ?



Penultimate [↑]e **fitness function:**

RespondResponsibly

PenultimateWidgets business analysts are worried about one of their key competitors, who has a very fast website.

PenultimateWidgets website has traditionally not featured speed; they want to ensure that the responsiveness doesn't get worse.



Penultima[↑]e fitness function:

RespondResponsibly

- Spin up a build in an integration environment with representative data
- Use an automated testing tool (such as Selenium or Watir) to automate visiting the pages with an SLA
- Time the rendering of the page (using a tool such as Watchtower)
- Fail the build if the response time exceeds the threshold



Penultimate [↑]e **fitness function:**

Monitor All The Things

PenultimateWidgets wants to ensure that Java and .NET applications support monitoring.

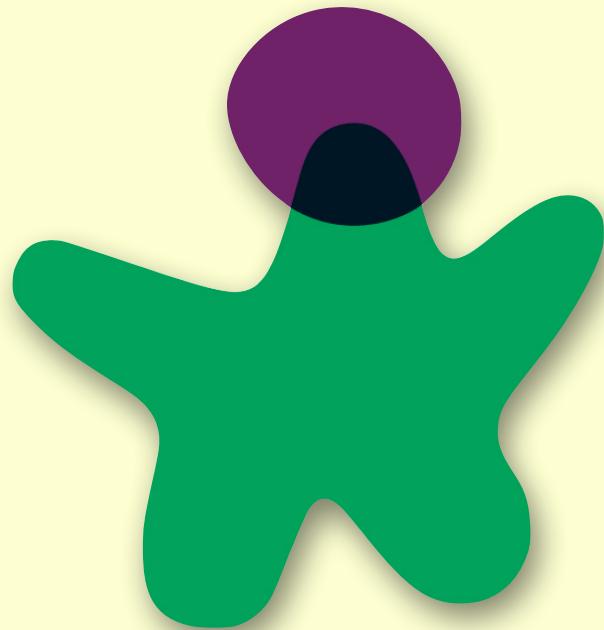


Penultima ↑e **fitness function:**

Monitor All The Things

- create a test during the pre-flight building of the machine image to ensure monitoring ports are listening properly
- fail the build if any development team skipped or mis-configured monitoring

Anemic BA Anti-pattern

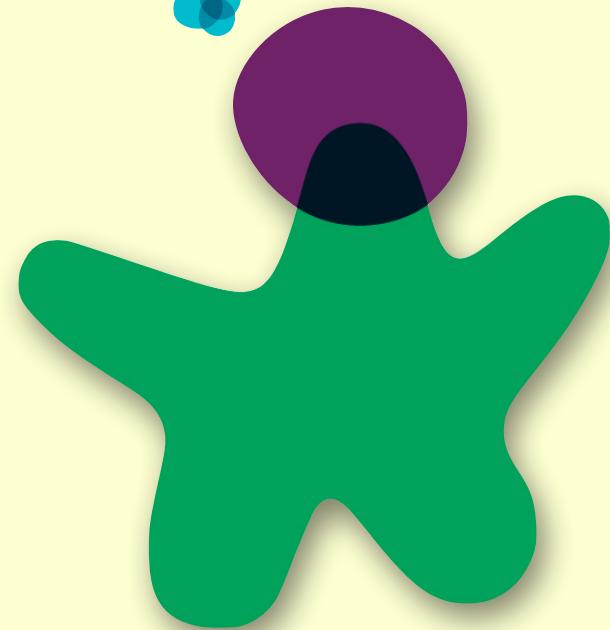


Product Owner



Developers

Anemic BA Anti-pattern

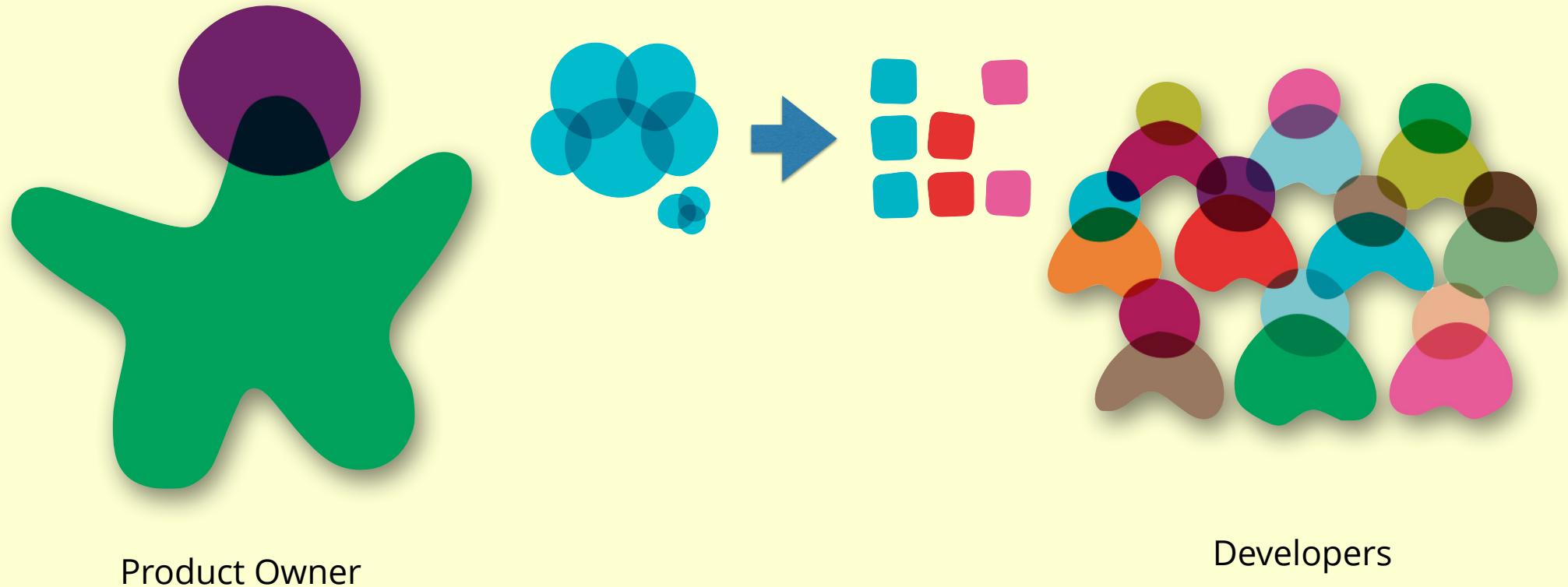


Product Owner

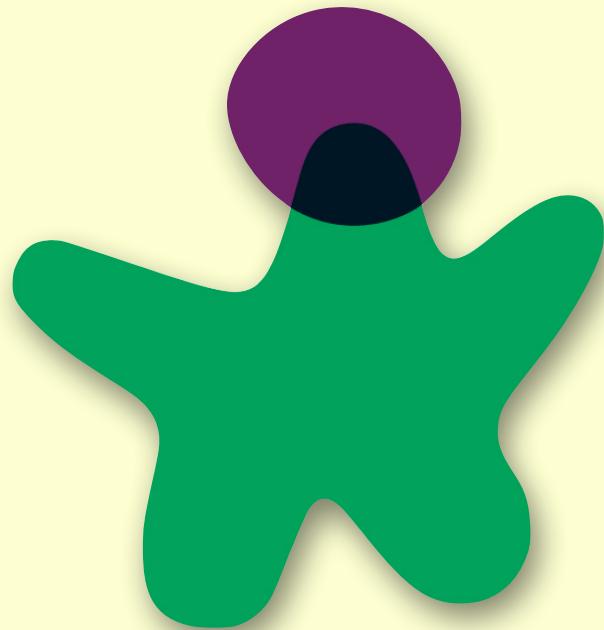


Developers

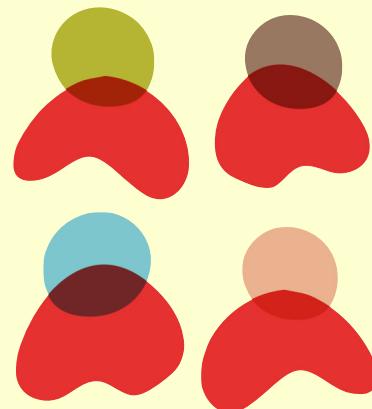
Anemic BA Anti-pattern



Anemic BA Anti-pattern



Product Owner



Business Analysts



Developers

Breaking Bad Habits



fitness function:

DireDeltas

PenultimateWidgets developers have developed a bad habit of keeping files checked out for days or weeks at a time, preventing continuous integration. As part of their attempt to improve engineering practices overall, the enterprise architects at PenultimateWidgets encourage frequent check-ins with corresponding good test coverage.



fitness function:

DireDeltas

- Create a fitness function that counts the number of lines in the check-in delta and fails if it exceeds the threshold
- Create a fitness function that counts the number of lines in delta from the test packages and the source packages and compute the ratio; fail if developers exceed the defined ratio



fitness function:

DireDeltas

good fitness
function?



fitness function:

DireDeltas

- Create a fitness function that counts the number of lines in the check-in delta and fails if it exceeds the threshold
- Create a fitness function that counts the number of lines in delta from the test packages and the source packages and compute the ratio; fail if developers exceed the defined ratio



fitness function:

No More View Models

PenultimateWidgets has a group of developers who cut their teeth on mainframe programming, where all work is done via a terminal. They have (mostly) switched to modern web development, but architects find that they often create models and workflows directly in web pages rather than support a cleaner MVC separation, and they would like to discourage this behavior.



Penultimate **fitness function:**

No More View Models

- use PMD (<https://pmd.github.io/>) or Language server protocol (<https://langserver.org/>) to build a tool that scans which classes developers instantiate in view code
 - build a list of restricted model and controller packages
 - if any view code instantiates a class from the restricted list, fail the build



Penultimate [↑]e fitness function:

Deploy All The Things

PenultimateWidgets has gotten tired of each application requiring an elaborate environment setup to deploy and run, and has decided that all new applications must be deployed within Docker containers. The PenultimateWidgets architects want to ensure that all applications follow the same standard deployment guidelines.



Penultima ↑e **fitness function:**

Deploy All The Things

Build a monitor that runs within the developers' staging area that inspects each running service to ensure that it is running within a container and supports common operational concerns such as logging, monitoring, and service discovery.

Make New Habits



Penultimate [↑]e **fitness function:**

Discover All The Things

PenultimateWidgets publishes an API for third-party, business-to-business integrations. To make it easier for clients to consume their services, they have instituted a convention that every endpoint delivers a documentation string when called with the additional parameter '&docs=true'. PenultimateWidgets architects want to ensure that all published endpoints include this documentation string.



Penultima ↑e **fitness function:**

Discover All The Things

Developers build a continuous monitor that calls each method in the published API at random from a dictionary, checking that each endpoint documentation invocation delivers an HTML page and not an HTML 404.



Penultimate [↑]e **fitness function:**

Install All The Things

PenultimateWidgets distributes a desktop application to select clients that facilitates coordination between business partners. The application is written in C#, using .NET desktop libraries. In the past, PenultimateWidgets has exhibited problems with the installer not working correctly for some edge cases, and they want to ensure that their clients have a good installation experience.

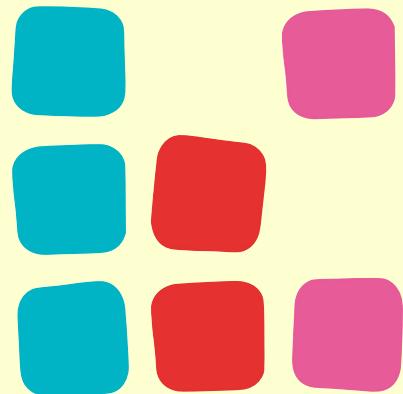
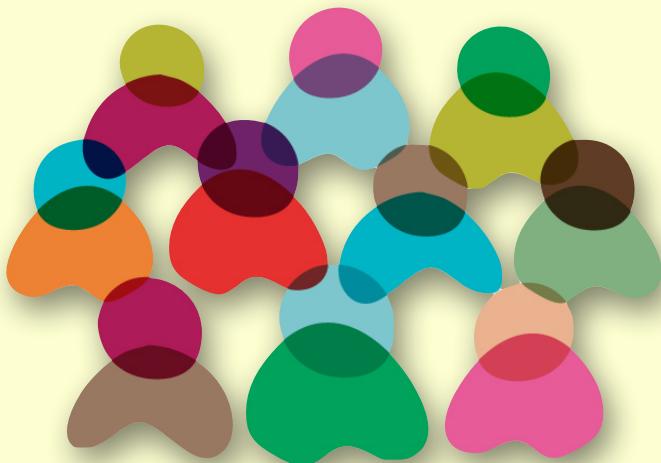


Penultima ↑e **fitness function:**

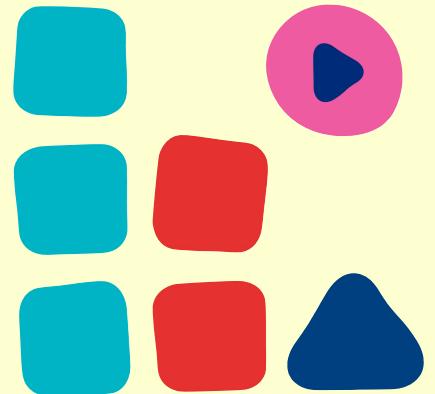
Install All The Things

- As part of the deployment pipeline, provision a pristine Windows environment for each supported version
- Install the new build and run the installation routine
- Smoke test select parts of the application to ensure that all components installed correctly.

Aggressive Back Porting

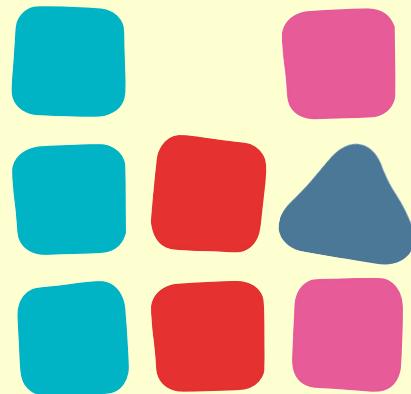
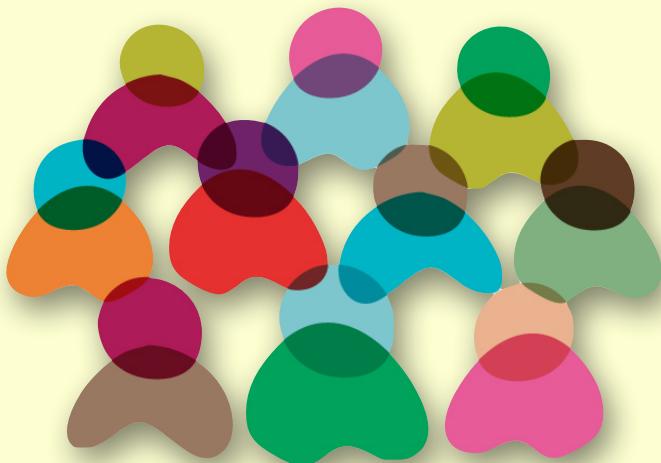


Version X

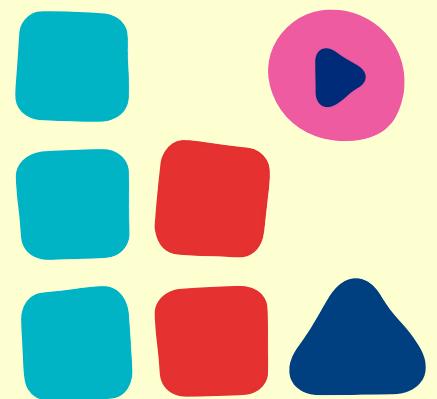


Version X+1

Aggressive Back Porting



Version X



Version X+1



Penultimate [↑]e fitness function:

Break on Upgrade

PenultimateWidgets builds a number of applications in Ruby on Rails, which has an active release schedule. Occasionally, developers really want a feature that appears in version X+1, where PenultimateWidgets is currently on version X. To acquire the desired functionality, developers back-port the new features from X + 1 into X. However, when PenultimateWidgets finally does upgrade to X + 1, the back ported features are almost certain to break because of incompatibilities.



Penultimate ↑ fitness function:

Break on Upgrade

- Add a unit test to the code base that checks the version number of the framework. If the framework version is higher than the expected one, fail the build with a warning that back-ported features will likely not work.
- Catalog all the back-ported features in the unit test to make it easy to identify them when it becomes time to replace them.



Penultimate [↑]e **fitness function:**

Upgrade All The Things

PenultimateWidgets has a bad habit of waiting too long to update core libraries and frameworks they depend upon for development. Waiting past several versions makes the eventual upgrade quite painful, and they have resolved to perform upgrades in a more timely manner.



Penultimate ↑e

fitness function:

Upgrade All The Things

- Use Dependabot to flag new major versions of frameworks and libraries.
- When a library updates, make an entry in a build database and start a 3-month clock.
- If the library or framework in question hasn't been updated in 3 months, fail the build.



Penultimate **fitness function:**

Depend on Dependencies

PenultimateWidgets has recently been burned by a Maven update that broke several applications yet wasn't detected until production. Architects and business people want to make sure this doesn't happen again.



Penultimate [↑] fitness function:

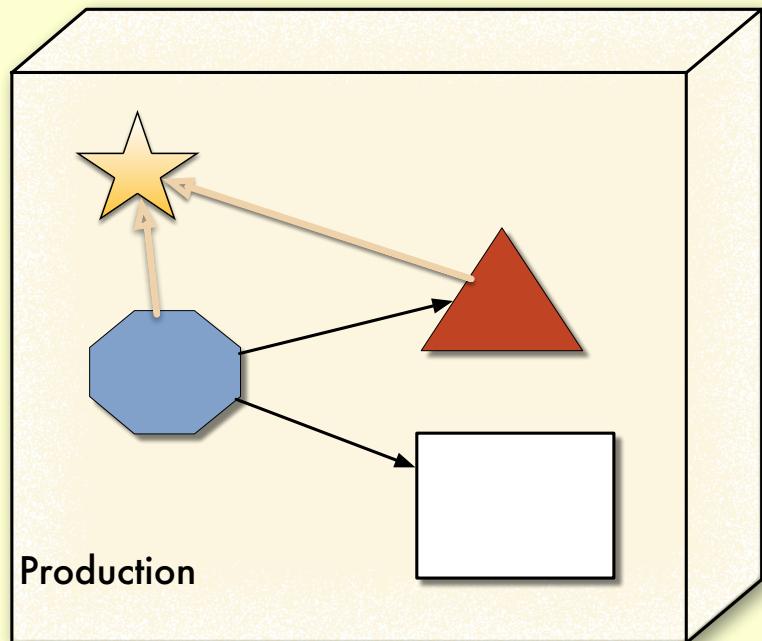
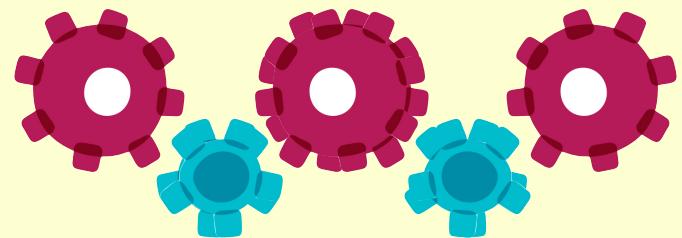
Depend on Dependencies

Use a deployment pipeline to trigger new builds and test suite execution any time any artifact of the project changes, including external dependencies. If the automatic build breaks, a developer must locate the problem and restore automatically.

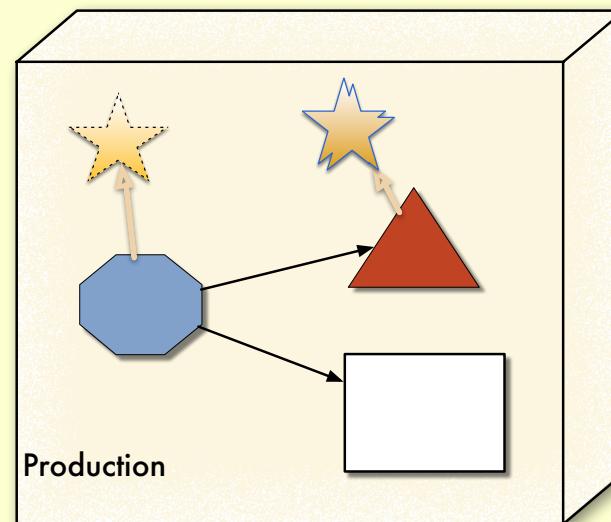
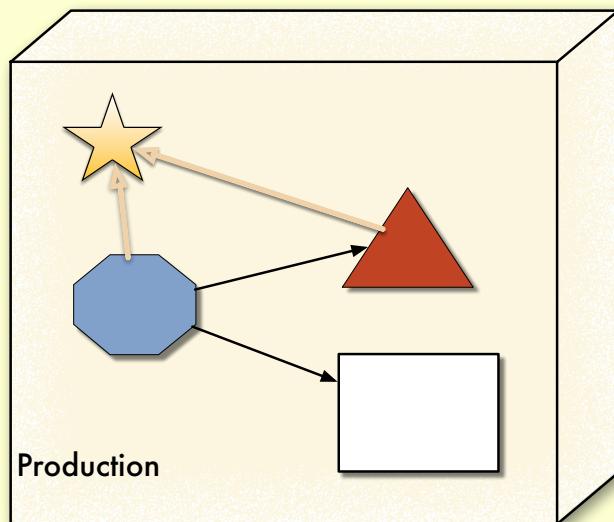
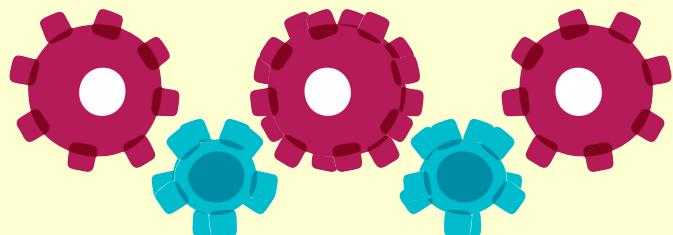
OR

Use Dependabot (<https://dependabot.com/>)

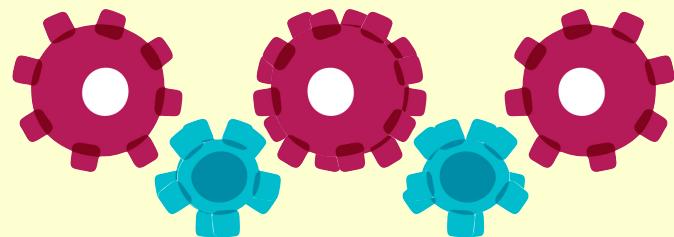
Penultima ↑ e



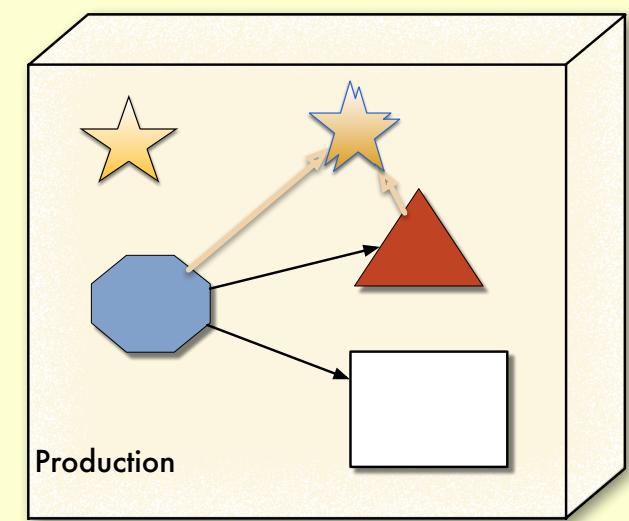
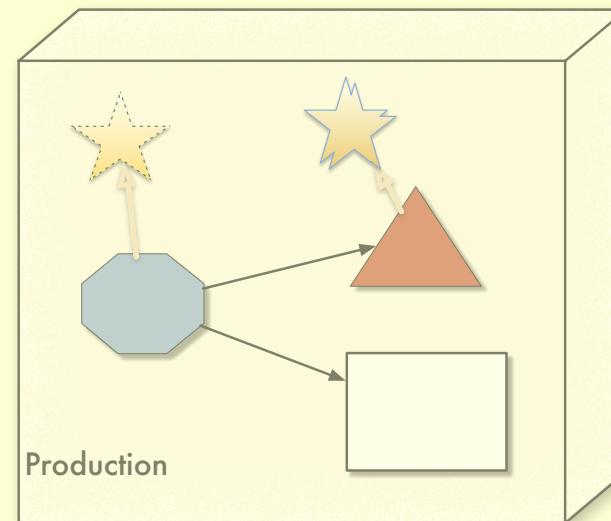
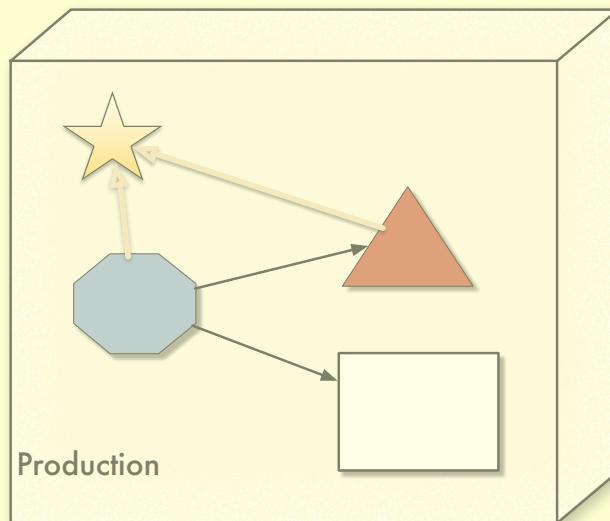
Penultima ↑ e



Penultima ↑ e



incremental



Penultima ↑ e



Evolving Routing

< >

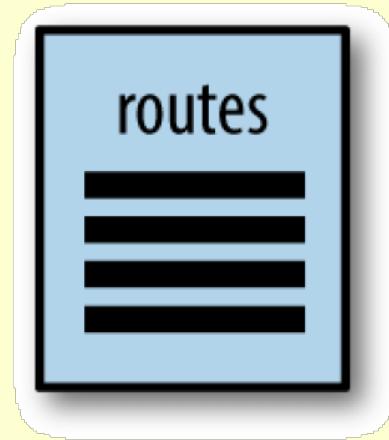
<home> <catalog><item>

Penultima ↑ e



Evolving Routing

Routes



Penultima ↑ e

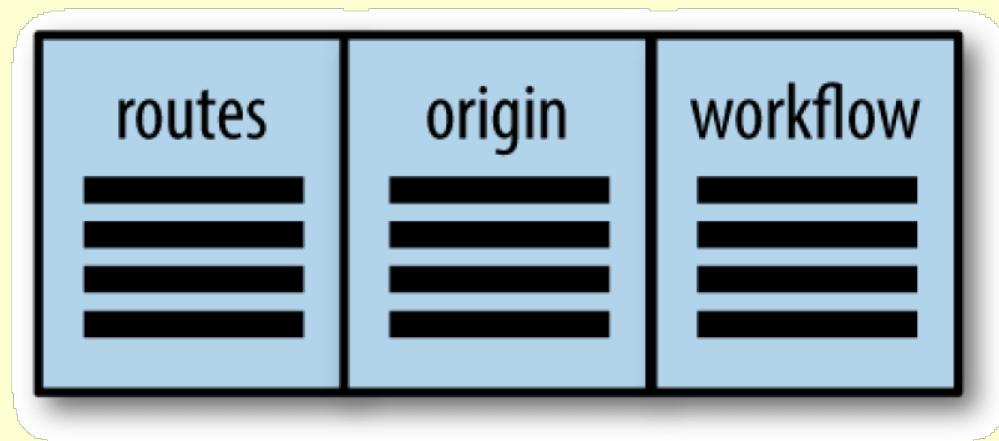


Evolving Routing

Routes



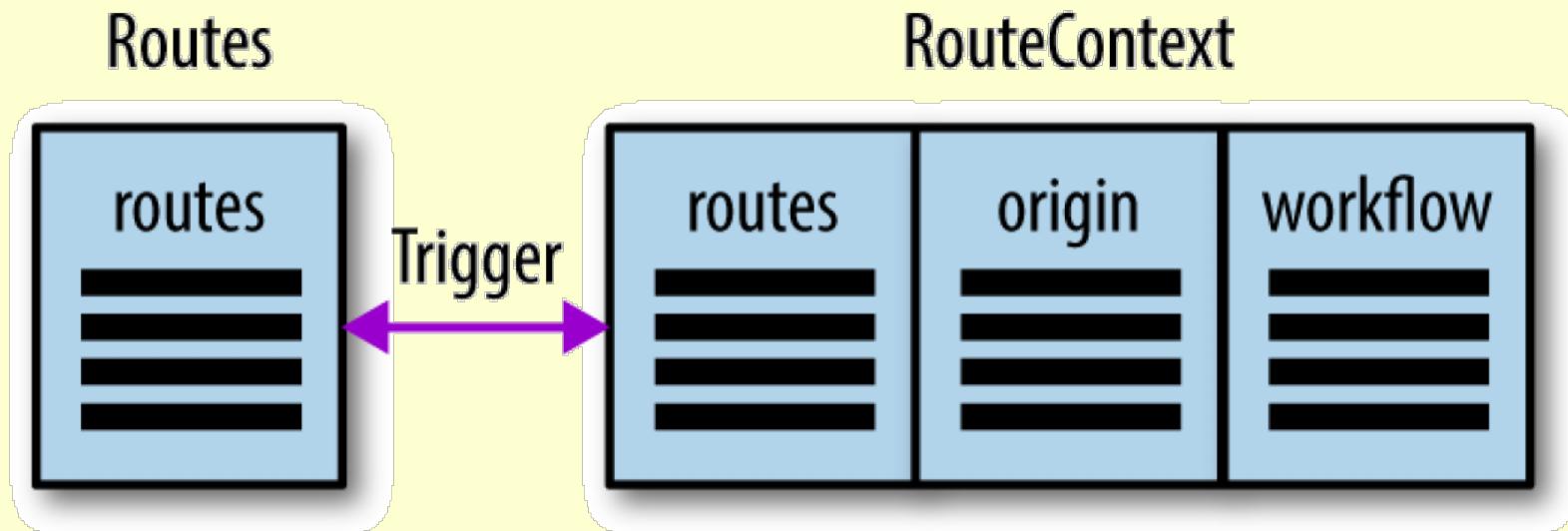
RouteContext



Penultima ↑ e



Evolving Routing

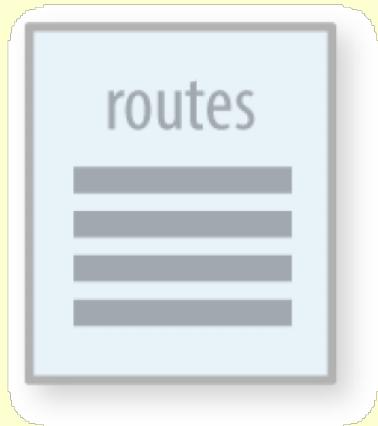


Penultima ↑ e

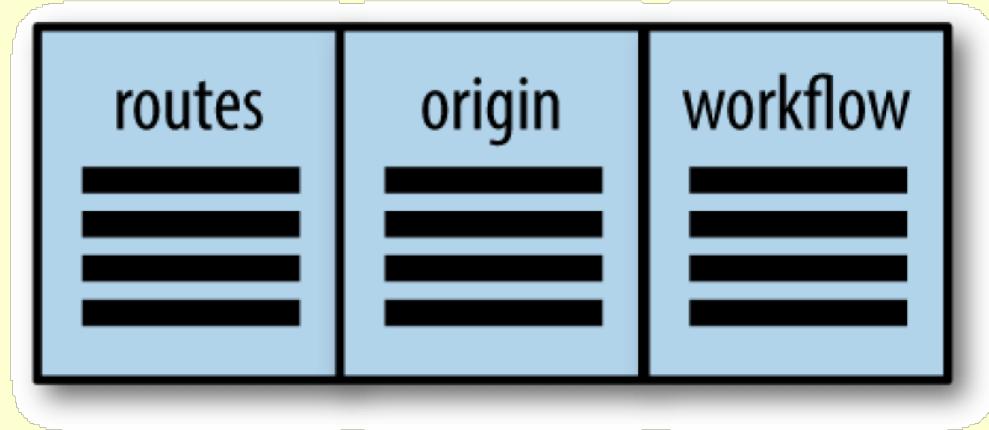


Evolving Routing

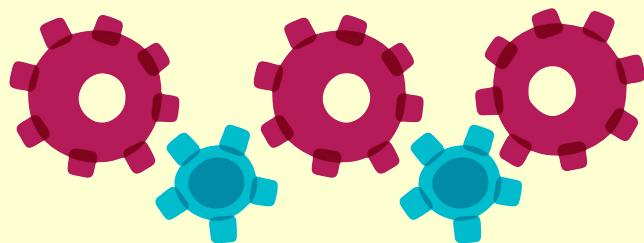
Routes



RouteContext



Penultimate ↑ e



Experimenting with New Markets





Penultimate ↑e **fitness function:**

MaintainTheMock

PenultimateWidgets has started experimenting with flashing the chips on their 'smart' widgets during the manufacturing process, allowing them to make changes in hardware-based code more easily and quickly. However, they must make sure that the mock version of the hardware API the developers use is always up to date with the real API.



Penultima ↑e **fitness function:**

MaintainTheMock

Build a fitness function that matches the mock API method signatures, parameters, and types to the real API on the hardware; fail the build if the team has allowed it to get out of sync.

govern

Origin

GREEK

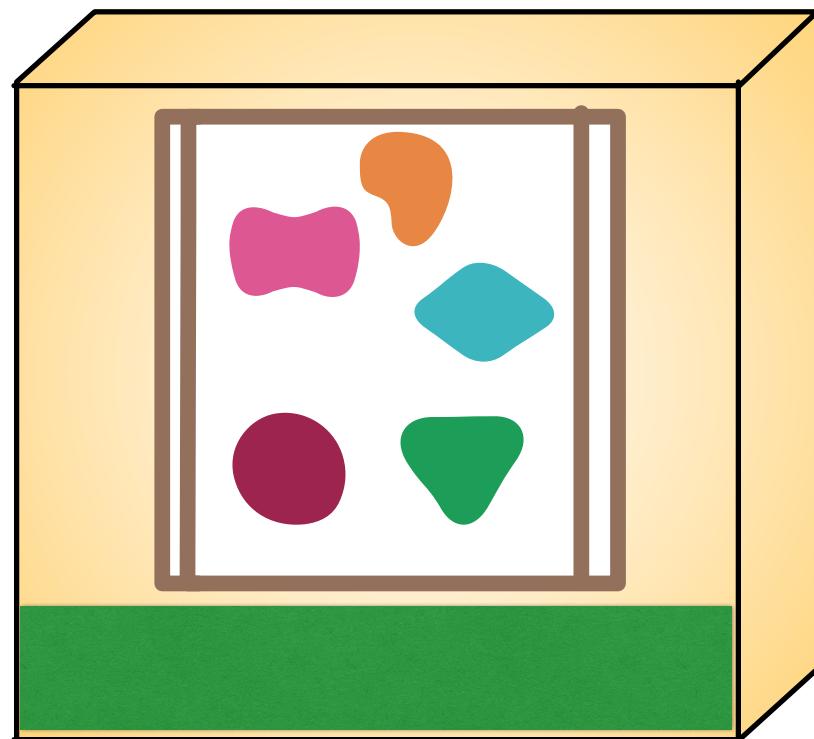
LATIN

OLD FRENCH

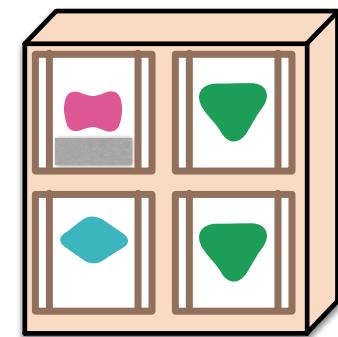
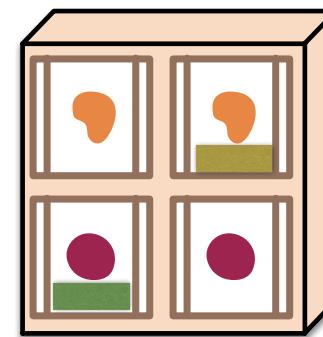
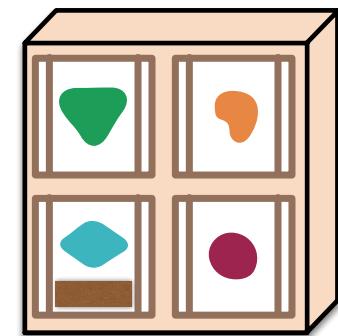
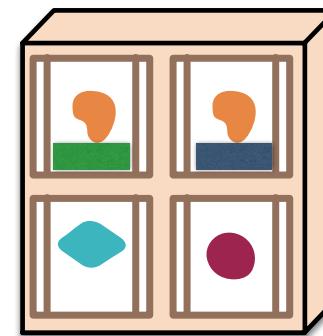
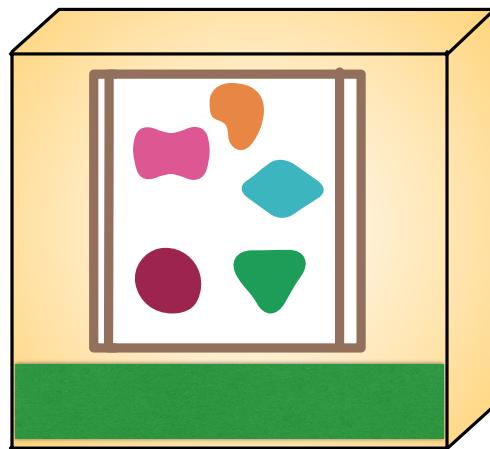
kubernan → gubernare → gouverner → govern
to steer to steer, rule Middle English

- to control, direct, or strongly influence the actions and conduct of
- to exert a determining or guiding influence in or over
- to hold in check

monolithic governance



decentralized governance



govern

Origin

GREEK

LATIN

OLD FRENCH

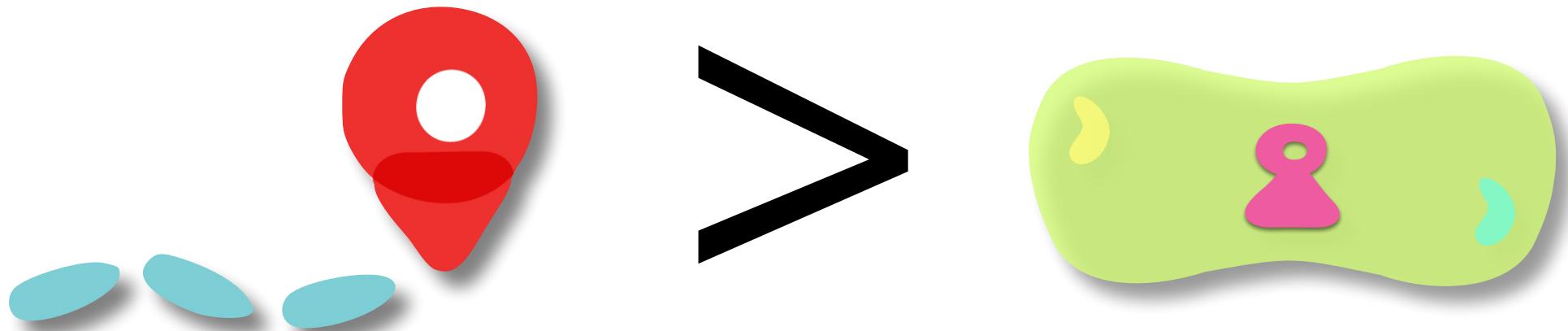
kubernan → gubernare → gouverner → govern
to steer to steer, rule Middle English

— to serve as a precedent or deciding principle for

20th Century Governance



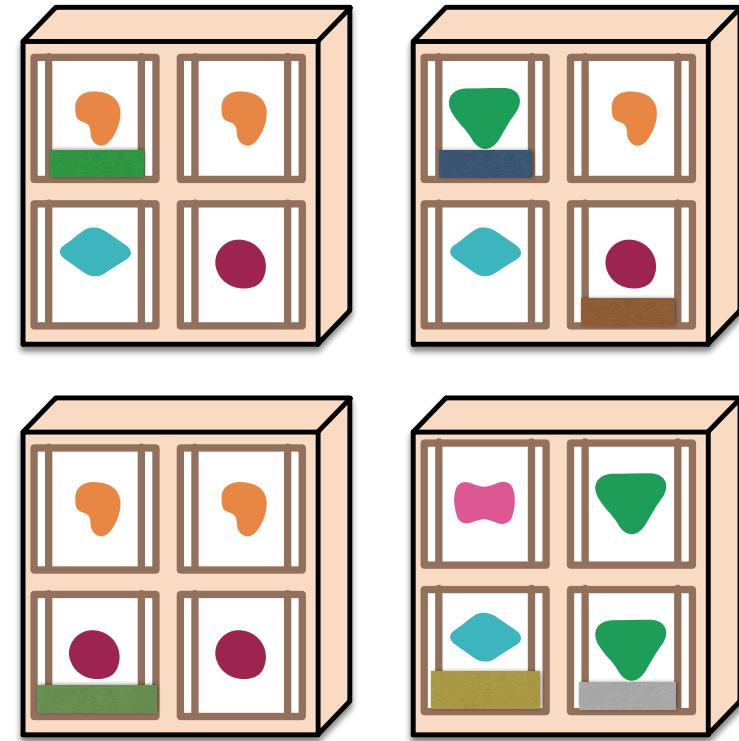
21st Century Governance



guidance over cost savings

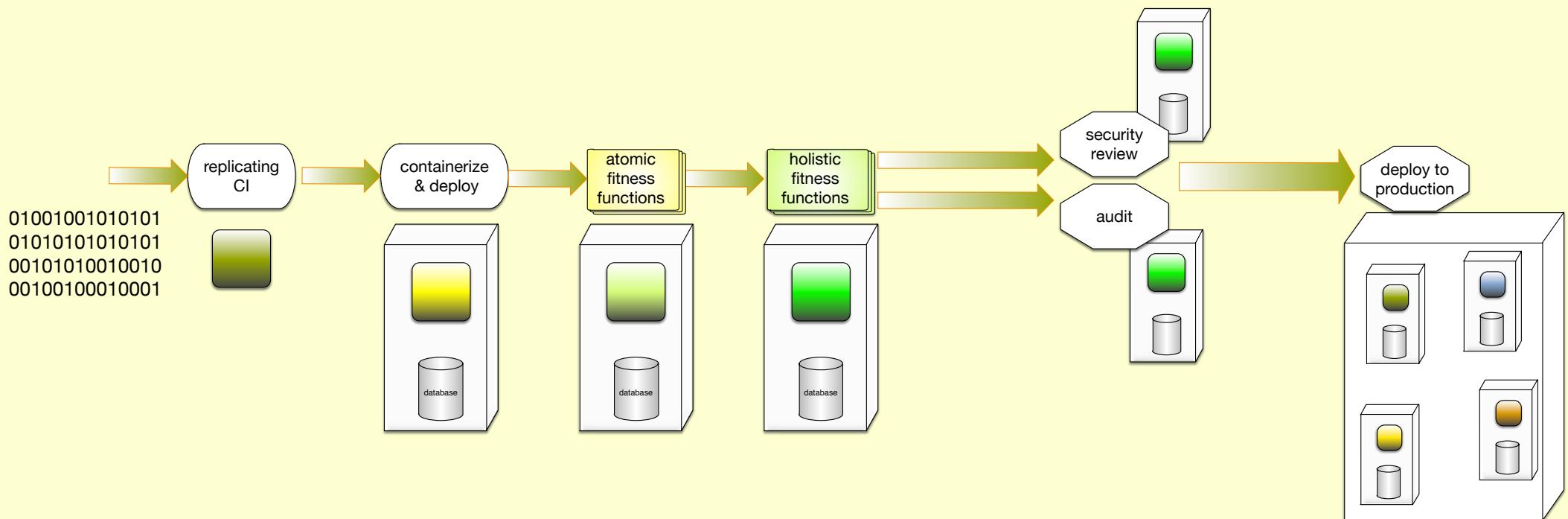
"Goldilocks" Governance

Choose technology stacks
appropriate to problem scale.





Deployment Pipeline





Penultimate [↑] fitness function:

Zero Day Security Check

PenultimateWidgets management has become concerned about zero-day exploits in open source libraries and has tasked the security team with coming up with a way of ensuring that projects do not use known compromised versions.

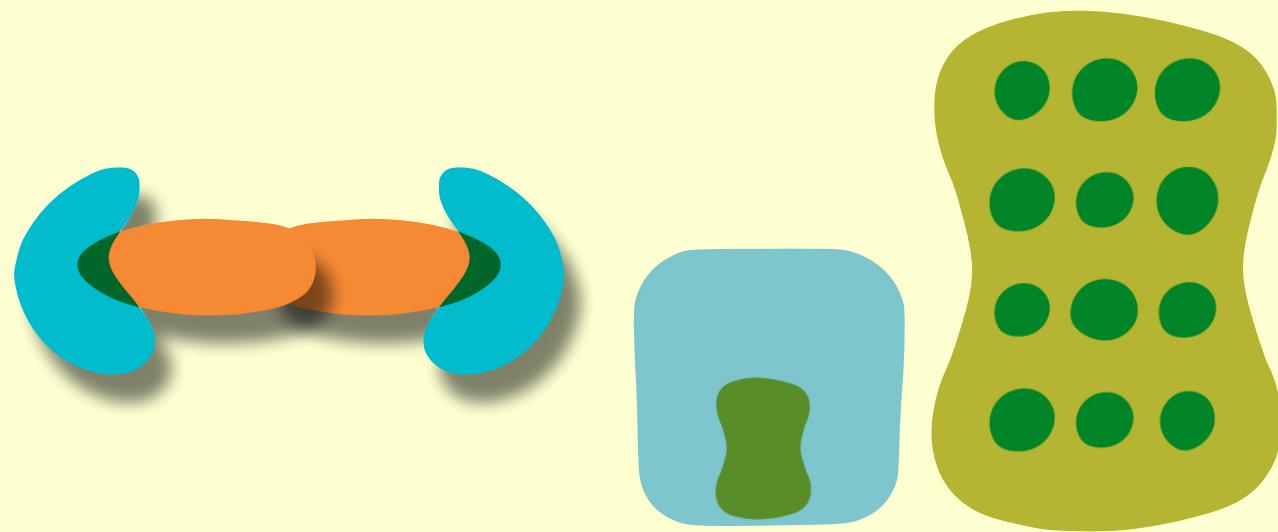
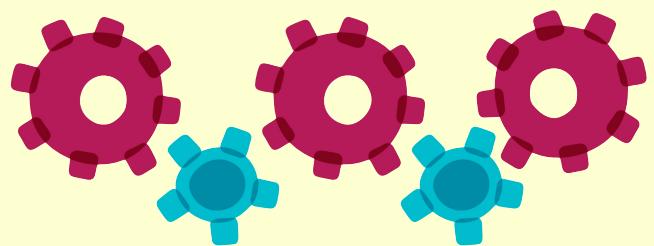


Penultima[↑]e **fitness function:**

Zero Day Security Check

- build a common fitness function into every deployment pipeline for the security team
- have the security fitness function check version numbers of deployed libraries
- if a tainted version is in use, fail the build and notify the team

Penultima ↑ e





Penultimate [↑] fitness function:

Doc Sync With API

PenultimateWidgets publishes an API for external vendors to check on order status, availability, and other B2B perks. However, the external partners rely on the documentation of the API, which sometimes becomes outdated when developers add new functionality. The PenultimateWidgets architects want to ensure that documentation is always up to date, especially method signatures and data formats.



fitness function:

Doc Sync With API

- Parse the code to look for public method signatures
- Parse the documentation looking for <code> tags, which surround method signatures and parameters
- Ensure that each tagged element includes a description
- Add a Publication Date value to the public website; after new deployments, check to make sure the deployment time matches the Publication date



PenultimateWidgets fitness function:

Sell The Platform

PenultimateWidgets is in the process of rebuilding their core platform, incorporating some key features that will appeal to others in a similar problem space. PenultimateWidgets plans to sell their platform to other companies, but worry that the differentiating factors (such as performance, scale, and elasticity) will suffer as clients start making changes to the platform, ultimately harming PenultimateWidgets platform's reputation. How can they sell their platform and still ensure that the critically important characteristics remain unchanged?

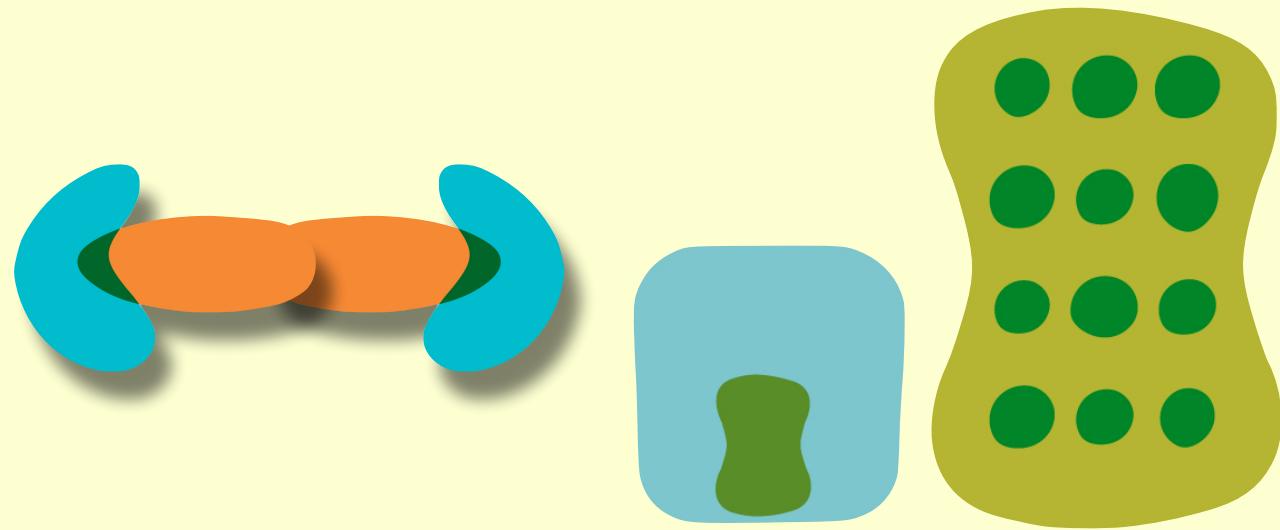
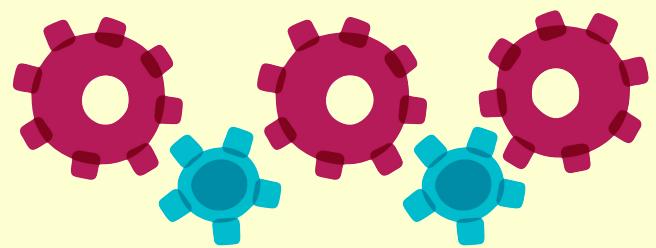


Penultimate [↑] fitness function:

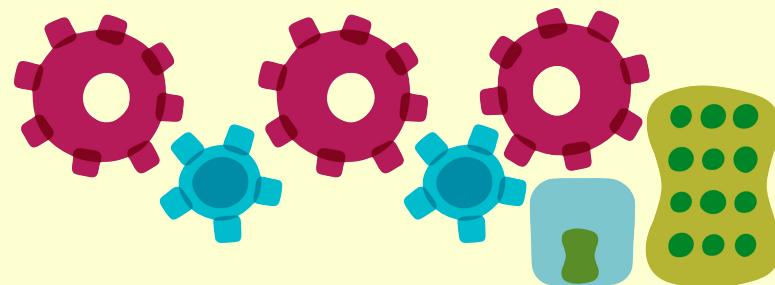
Sell The Platform

- PenultimateWidgets sells not only the platform but the running deployment pipeline for the platform as well. PenultimateWidgets engineers make sure that all the fitness functions run in the new client's environment.
- PenultimateWidgets will continue to certify the platform as long as all their fitness functions continue to execute successfully.

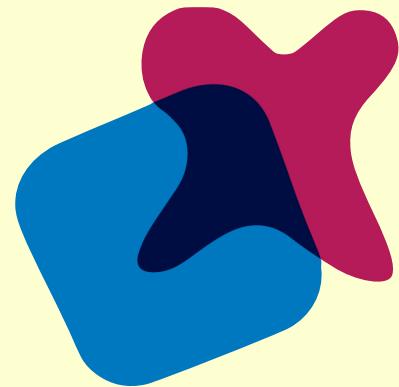
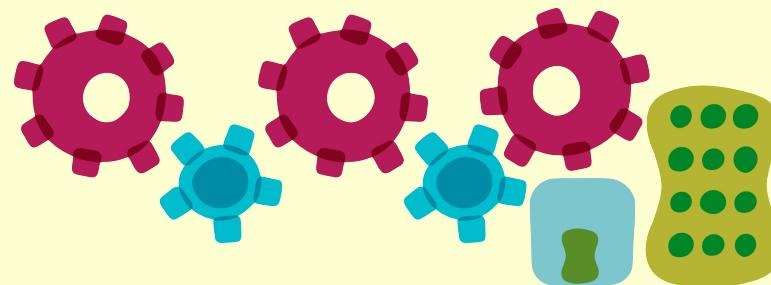
Penultima ↑ e



Penultima ↑ e

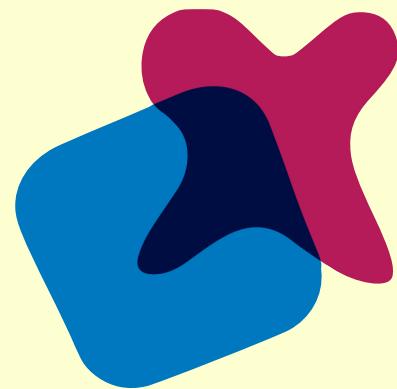
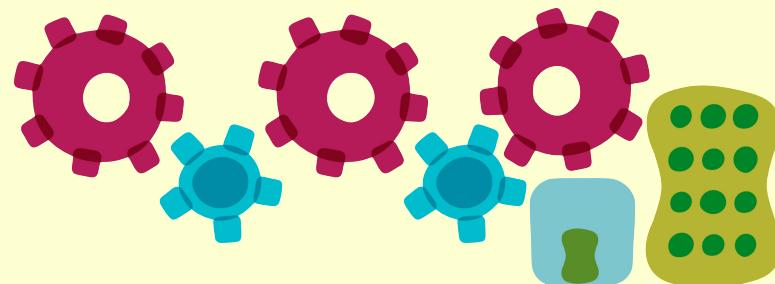


Penultima↑e



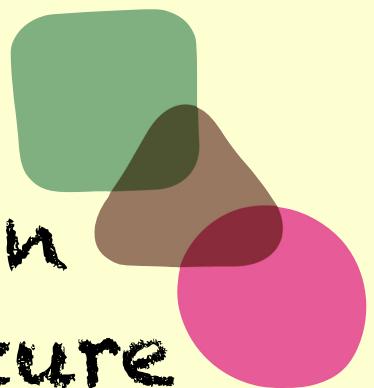
alien artifacts!

Penultima↑e

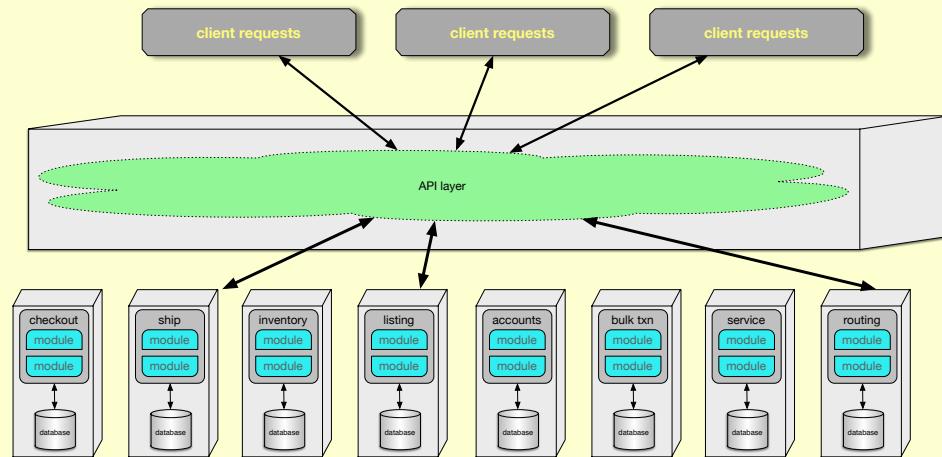


alien artifacts!

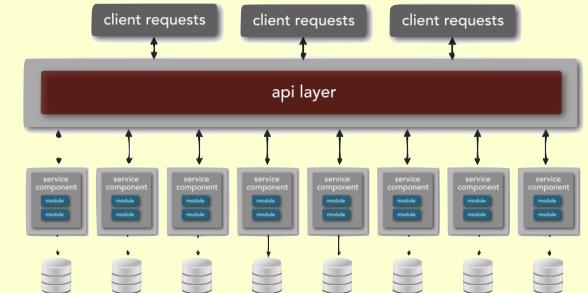
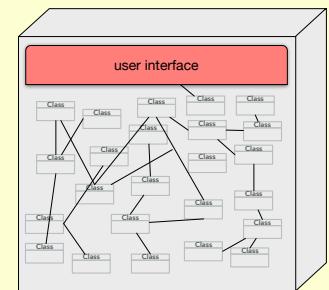
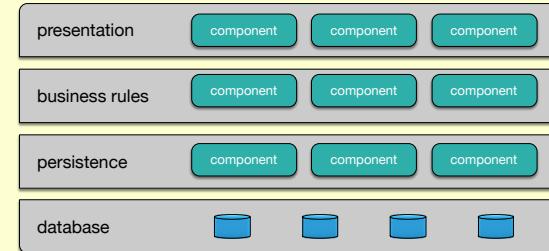
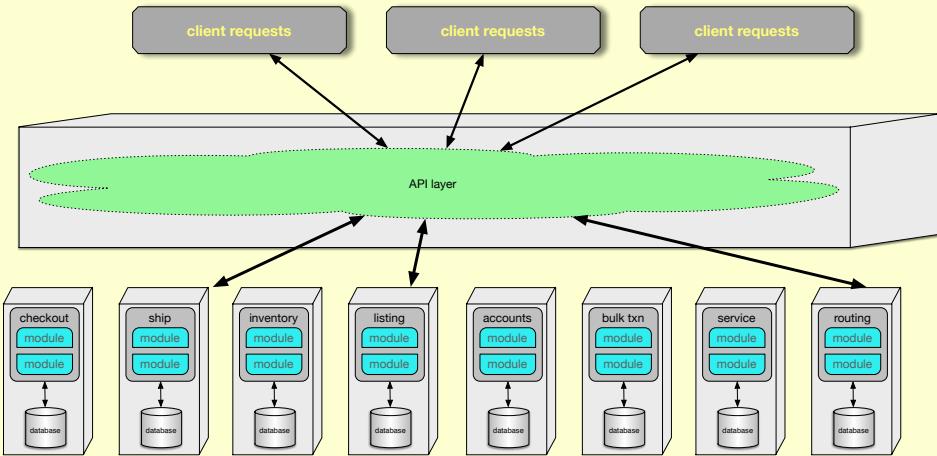
integration
architecture



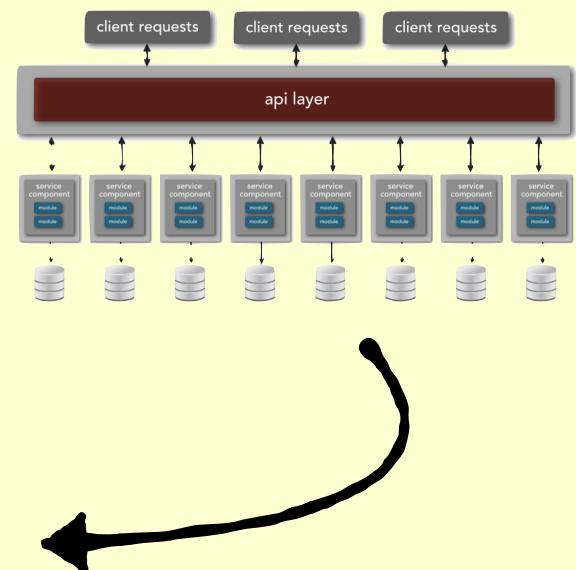
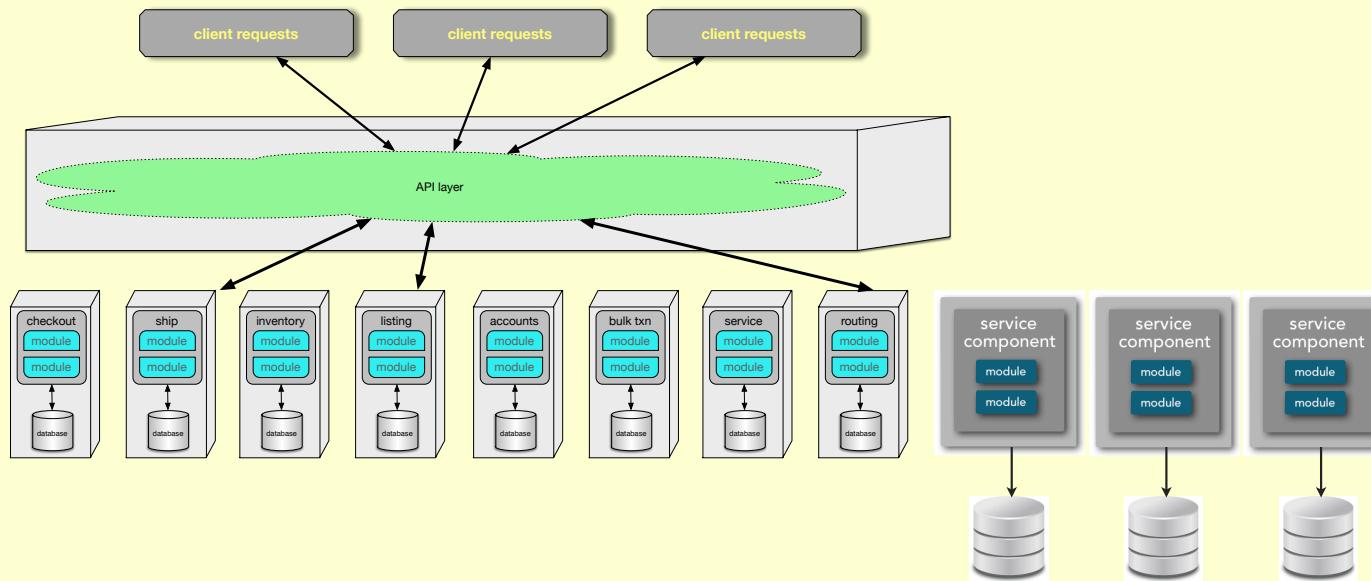
(Forced) Integration



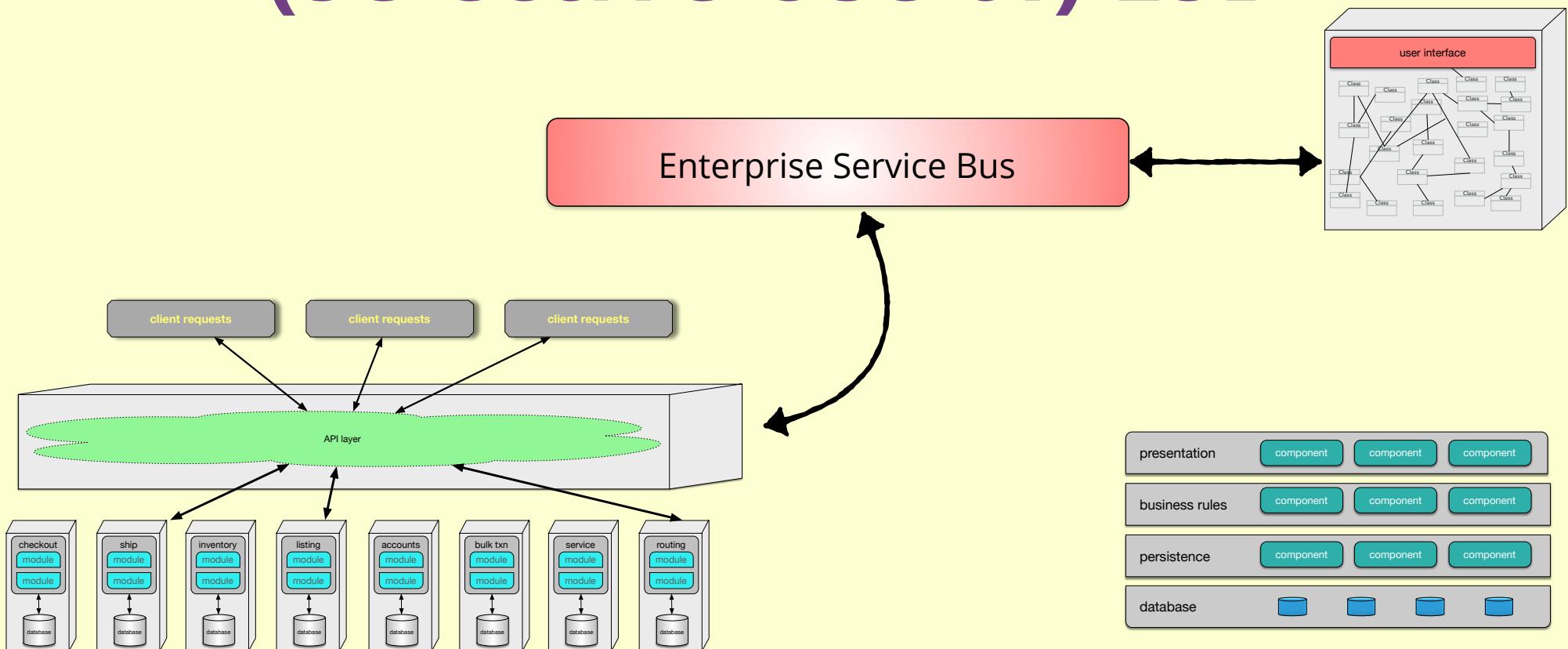
(Forced) Integration



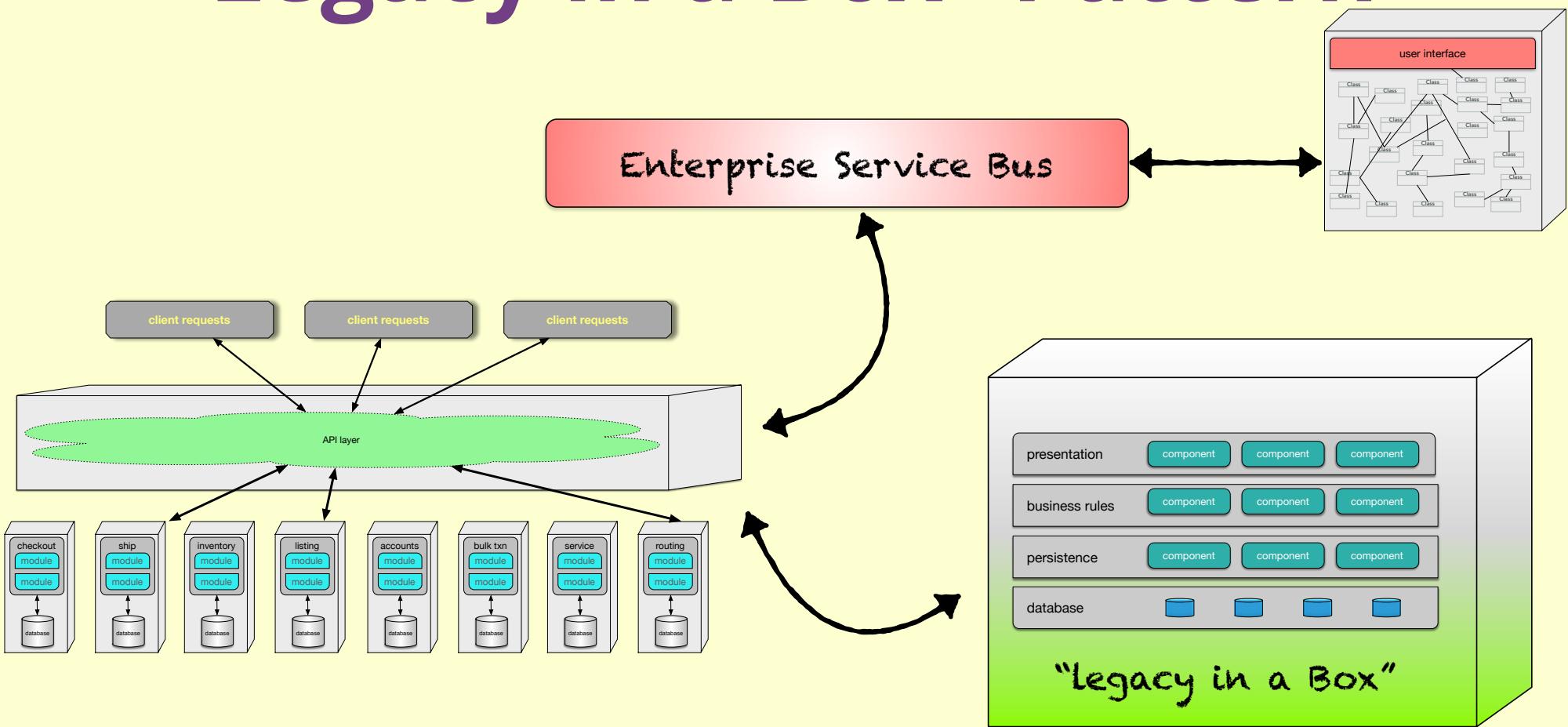
(Forced) Integration



(Selective Use of) ESB



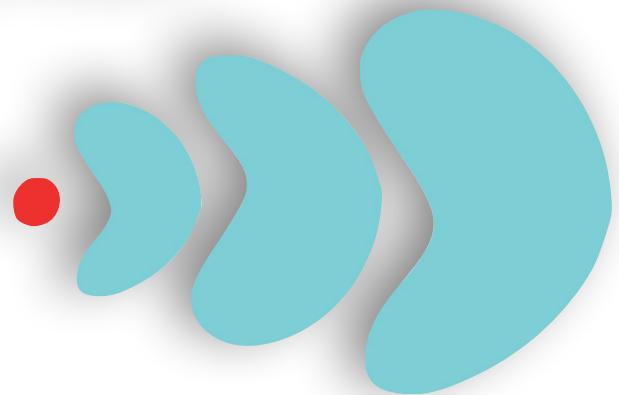
“Legacy in a Box” Pattern



puBLiShinG goVeRnANce



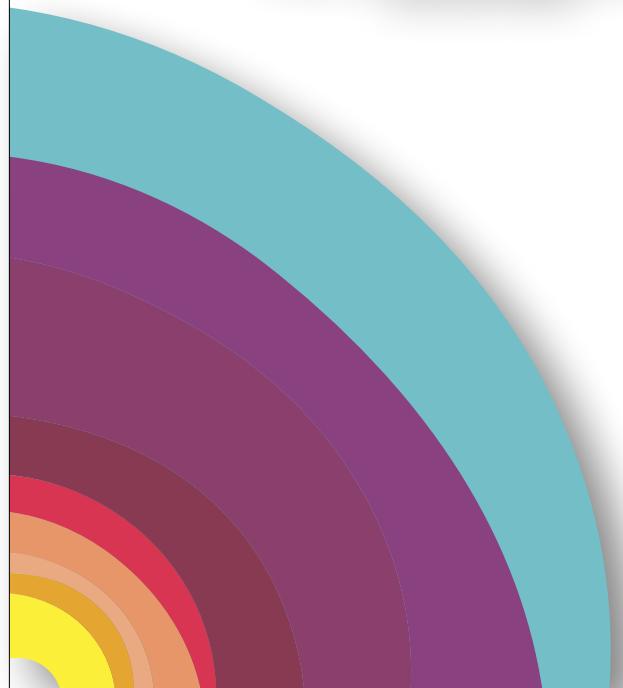
Build Your Own
Technology Radar



ThoughtWorks®

Technology Radar

OUR THOUGHTS ON JAVASCRIPT, APIs,
CONWAY'S LAW, RE-DECENTRALIZATION
AND MUCH MORE



JULY 2014

thoughtworks.com/radar

THE RADAR

TECHNIQUES

ADOPT

- 1 Capturing client-side JavaScript errors
- 2 Continuous delivery for mobile devices
- 3 Mobile testing on mobile networks
- 4 Segregated DOM plus node for JS Testing
- 5 Windows Infrastructure automation

TRIAL

- 6 Capture domain events explicitly
- 7 Client and server rendering with same code
- 8 HTML 5 storage instead of cookies
- 9 Instrument all the things
- 10 Masterless Chef/Puppet
- 11 Micro-services
- 12 Perimeterless enterprise
- 13 Provisioning testing
- 14 Structured Logging

ASSESS

- 15 Bridging physical and digital worlds with simple hardware
- 16 Collaborative analytics and data science
- 17 Containerization
- 18 Development environments in the cloud
- 19 Focus on mean time to recovery
- 20 Machine image as a build artifact
- 21 Tangible interaction

HOLD

- 22 Cloud lift and shift
- 23 Ignoring OWASP Top 10
- 24 Siloed metrics
- 25 Velocity as productivity

PLATFORMS

ADOPT

- 26 Elastic Search
- 27 MongoDB
- 28 Neo4j
- 29 Node.js
- 30 Redis
- 31 SMS and USSD as a UI

TRIAL

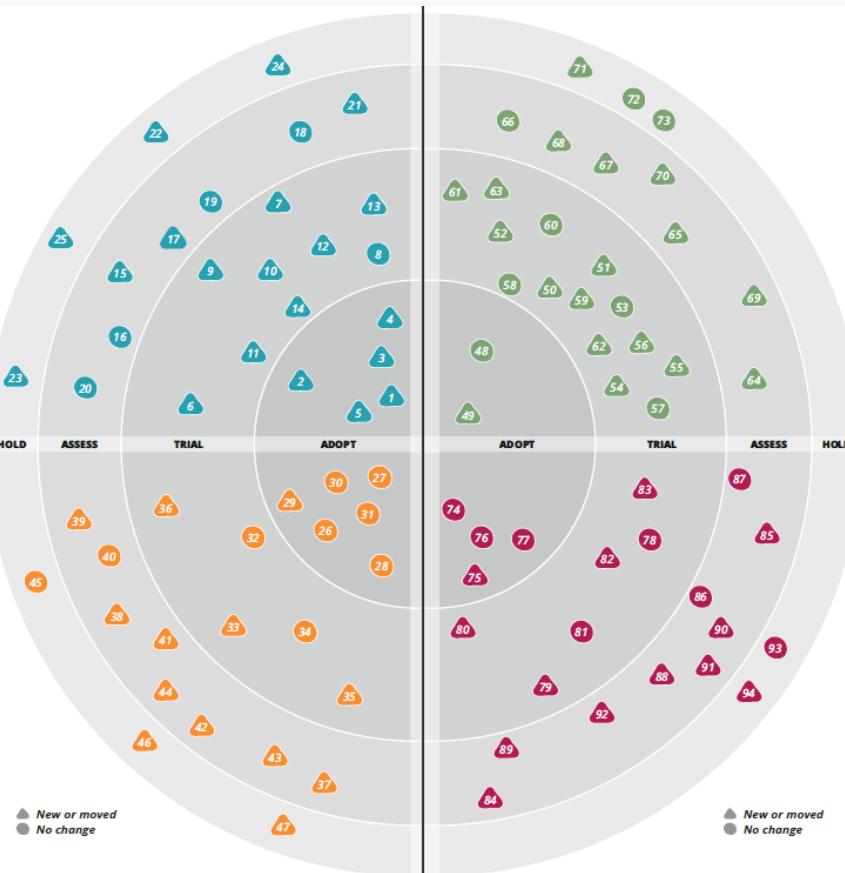
- 32 Hadoop 2.0
- 33 Hadoop as a service
- 34 OpenStack
- 35 PostgreSQL for NoSQL
- 36 Yumi

ASSESS

- 37 Akka
- 38 Backend as a service
- 39 Low-cost robotics
- 40 PhoneGap/Apache Cordova
- 41 Real-time Clouds
- 42 SPDY
- 43 Storm
- 44 Web Components standard

HOLD

- 45 Big enterprise solutions
- 46 CMS as a platform
- 47 Enterprise Data Warehouse



THE RADAR

TOOLS

ADOPT

- 48 DB3
- 49 Dependency management for JavaScript

TRIAL

- 50 Antible
- 51 Calabash
- 52 Chaco Monkey
- 53 Gatling
- 54 Grunt.js
- 55 Heroku
- 56 ION fonts
- 57 Librarian-puppet and Librarian-Chef
- 58 Logstash & Graylog2
- 59 Moco
- 60 PhantomJS
- 61 Puppet On Paper
- 62 SnapCI
- 63 Snowplow Analytics & Plwirk

ASSESS

- 64 Cloud-init
- 65 Docker
- 66 Octopus
- 67 Sensu
- 68 Travis for OSX/IOS
- 69 Visual regression testing tools
- 70 Xamarin

HOLD

- 71 Ant
- 72 Heavyweight test tools
- 73 TFS

LANGUAGES & FRAMEWORKS

ADOPT

- 74 Clojure
- 75 Dropwizard
- 76 Scala, the good parts
- 77 Sinatra

TRIAL

- 78 CoffeeScript
- 79 Go language
- 80 Hapi
- 81 Play Framework 2
- 82 Reactive Extensions across languages
- 83 Web API

ASSESS

- 84 Elixir
- 85 Julia
- 86 Nancy
- 87 OWIN
- 88 Peter
- 89 Pointer Events
- 90 Python 3
- 91 TypeScript
- 92 Yeoman

HOLD

- 93 Handwritten CSS
- 94 JSF

The screenshot shows a web browser window with the ThoughtWorks logo at the top. The main content features a large, bold title 'BUILD YOUR INTERACTIVE RADAR' overlaid on a graphic of overlapping semi-circles in shades of green and yellow. Below the title, there's a section titled 'How to build your own radar'. It includes a paragraph about sharing the output of a radar creation exercise and a note that the service is in beta. A 'See a demo' button is present. To the right, there's a form for signing up with fields for First Name, Last Name, Email Address, and Role, each marked with a red asterisk indicating it's required.

ThoughtWorks®

BUILD YOUR INTERACTIVE RADAR

How to build your own radar

Once you've ran your radar creation exercise, you'll want to share the output. Our "radar visualization" service generates an interactive version of your technology radar.

This service is inspired by the [ThoughtWorks Technology Radar](#). It's currently in beta and provides just enough functionality to serve its purpose. You can [give us feedback, suggest feature improvements and get updates here](#).

See a demo

How to use

All you need to visualize your radar is a [public Google Sheet](#) containing your

Hear more about building your own radar

First Name: *

Last Name: *

Email Address: *

Role: *

<https://info.thoughtworks.com/visualize-your-tech-strategy-guide.html>

Example Technology Radar

	A	B	C	D	E
1	<i>name</i>	<i>ring</i>	<i>quadrant</i>	<i>isNew</i>	<i>description</i>
2	Babel	adopt	tools	FALSE	This is the description. You can use basic html such as the stro and insert anchor links to docu
3	Consul	adopt	tools	FALSE	This is the description. You can use basic html such as the stro and insert anchor links to docu
4	Grafana	adopt	tools	FALSE	This is the description. You can use basic html such as the stro and insert anchor links to docu
5	Apache Kafka	trial	tools	TRUE	This is the description. You can use basic html such as the stro and insert anchor links to docu
6	Espresso	trial	tools	TRUE	This is the description. You can use basic html such as the stro and insert anchor links to docu
7	Consumer-driven co	adopt	techniques	FALSE	This is the description. You can use basic html such as the stro and insert anchor links to docu
8	Bug bounties	trial	techniques	TRUE	This is the description. You can use basic html such as the stro and insert anchor links to docu
9	Client-directed query	assess	techniques	FALSE	This is the description. You can use basic html such as the stro and insert anchor links to docu
10	Container security sc	assess	techniques	FALSE	This is the description. You can use basic html such as the stro and insert anchor links to docu

ThoughtWorks®

BUILD YOUR RADAR

Once you've [created your radar](#), you can use this service to generate an interactive version of your Technology Radar. Not sure how? [Read this first.](#)

Enter the URL of your public google sheet below...

e.g. https://docs.google.com/spreadsheets/d/1--_uLSNf/pubhtml

Build my radar

[Need help?](#)

A screenshot of a GitHub repository page. The URL in the browser bar is <https://github.com/thoughtworks/build-your-own-radar>. The repository name is **thoughtworks / build-your-own-radar**. The page shows basic repository statistics: 238 commits, 4 branches, 0 releases, 14 contributors, and an AGPL-3.0 license. A recent commit by NivedhaSenthil is highlighted. The repository has 54 watchers, 107 stars, and 72 forks. The code tab is selected. The repository description states: "A library that generates an interactive radar, inspired by <http://thoughtworks.com/radar/>".

thoughtworks / build-your-own-radar

Code Issues 7 Pull requests 0 Projects 0 Pulse Graphs

A library that generates an interactive radar, inspired by <http://thoughtworks.com/radar/>

radar thoughtworks opensource

238 commits 4 branches 0 releases 14 contributors AGPL-3.0

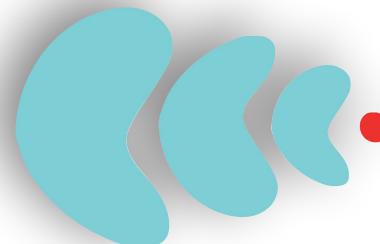
Branch: master ▾ New pull request Find file Clone or download ▾

NivedhaSenthil committed on GitHub Merge pull request #13 from shahadarsh/column_name_fix ... Latest commit e95bf09 on Jan 9

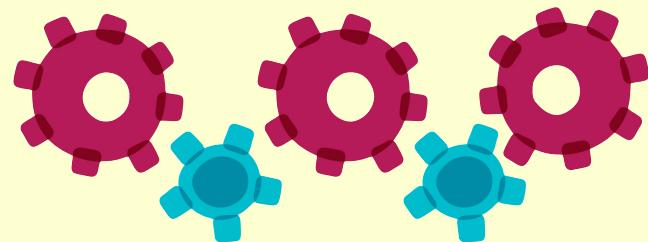
File	Description	Time
scripts	updated publish examples scripts to fetch from the right directory	2 years ago
spec	Arun: Accept sheet URL in various formats	3 months ago
src	Fix for columns using Capital letters	2 months ago
.gitignore	re-add examples to git ignore	5 months ago
.istanbul.yml	adding coverage to new code setup	5 months ago
LICENSE.md	Update LICENSE.md	4 months ago
README.md	Update README.md	2 months ago

<https://github.com/thoughtworks/build-your-own-radar>

puBLiShinG goVeRNaNce



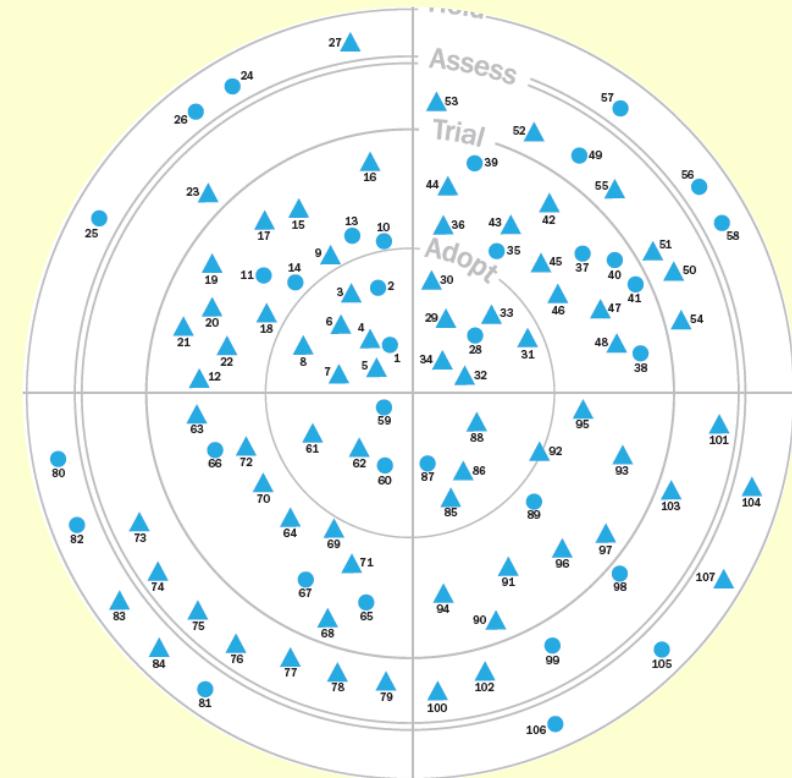
Penultimate ↑ e



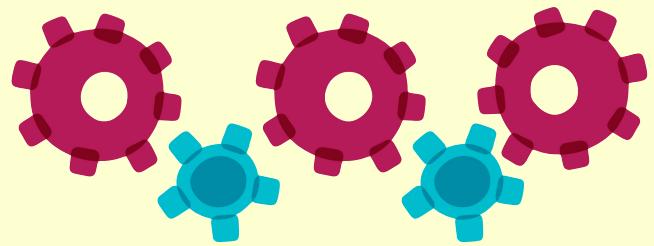
enterprise architecture
transparency

Broadcasting
R&D

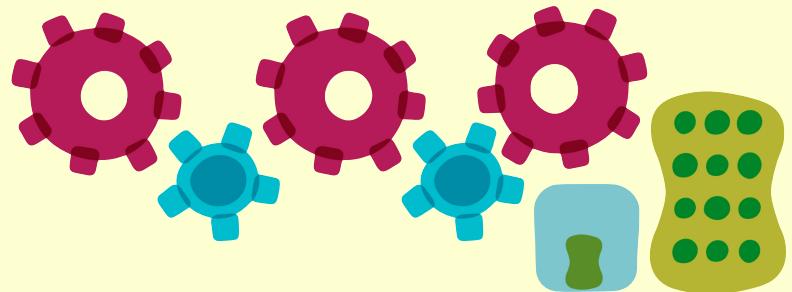
Setting WIP Limits
for experiments



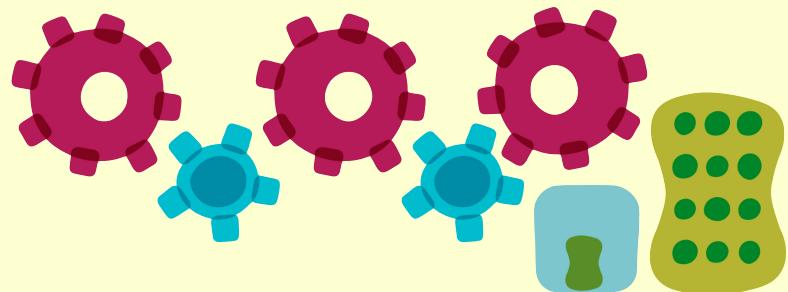
Penultima ↑ e

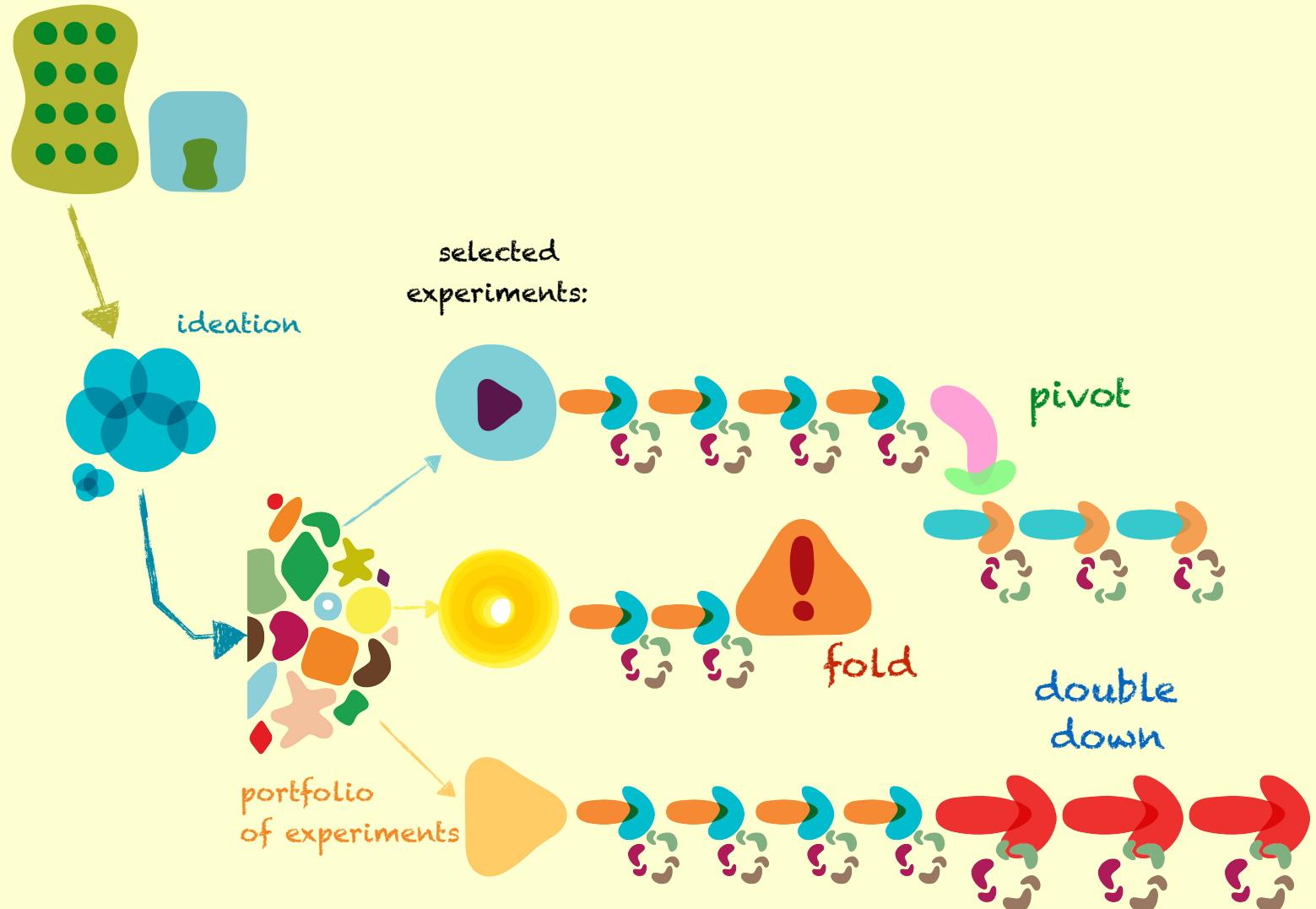


Penultima ↑ e

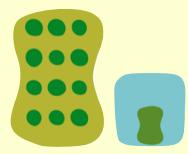
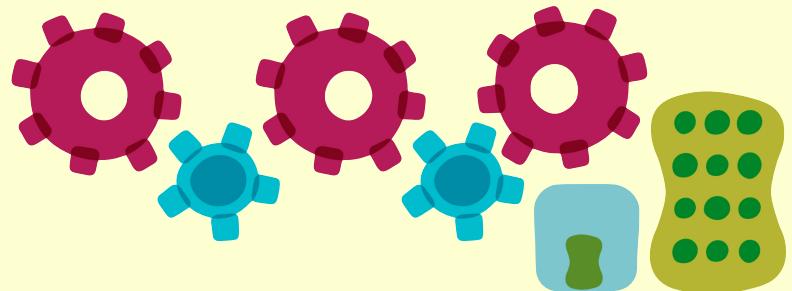


Penultima ↑ e

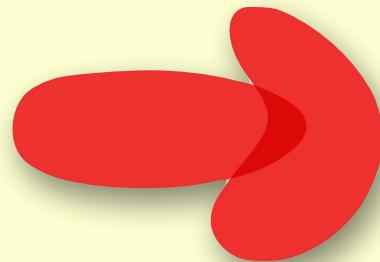
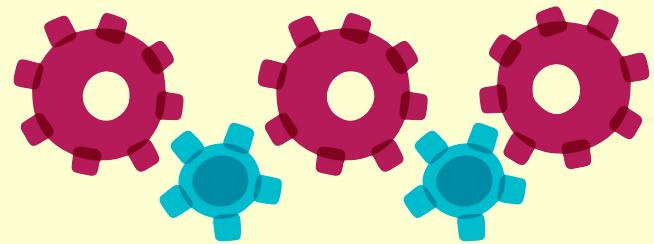




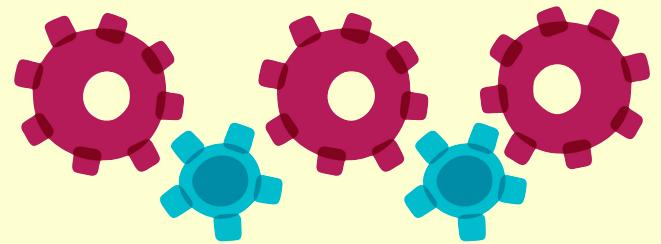
Penultima ↑ e



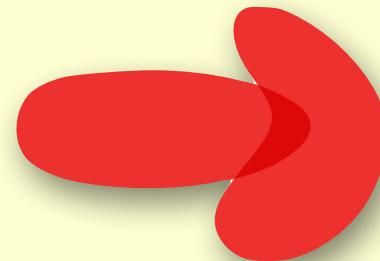
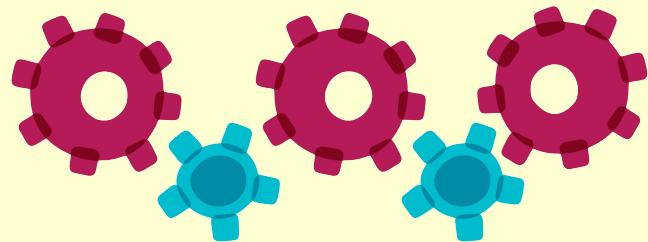
Penultima ↑ e



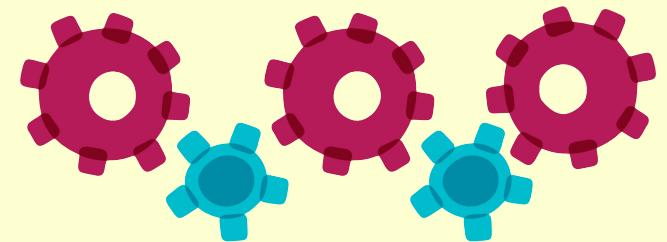
OpenUltima ↑ e



Penultima↑e



OpenUltima↑e



Evolutionary architecture provides
the substrate for 21st century growth.

Fitness Function Guidelines

most fitness function are local

Fitness Function Guidelines

most fitness function are local
global only when universally
applied.

Fitness Function Guidelines

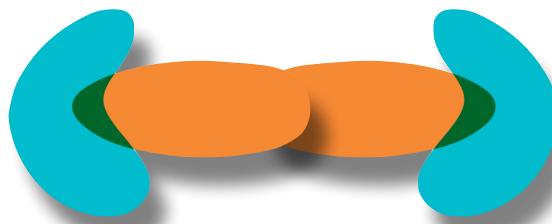
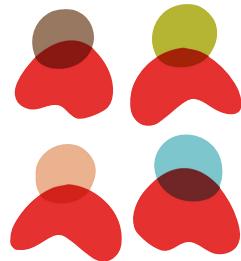
most fitness function are local
global only when universally
applied.

No EA  states!

Fitness Function Guidelines

developers must collaborate

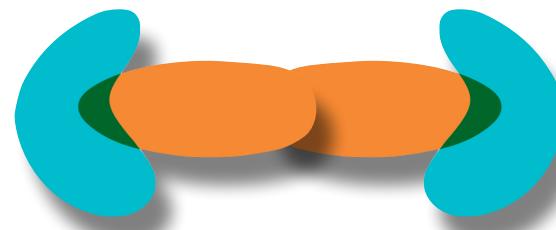
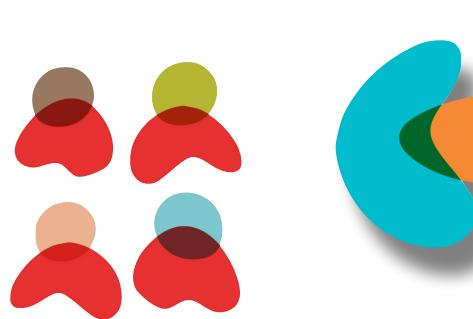
enterprise
architects



developers

Fitness Function Guidelines

developers must collaborate



No EA



states!

Fitness Function Guidelines

prefer automation but rely on
manual when needed

Fitness Function Guidelines

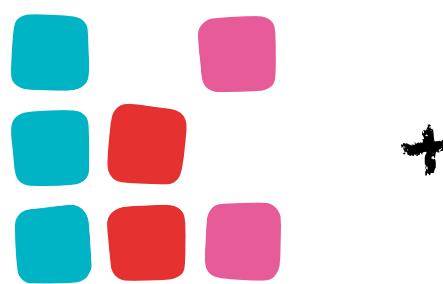
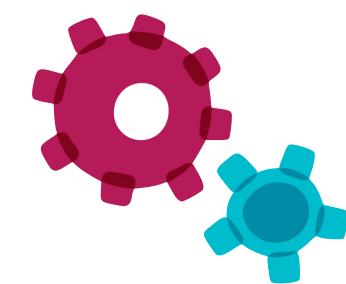
prefer automation but rely on
manual when needed

automation =

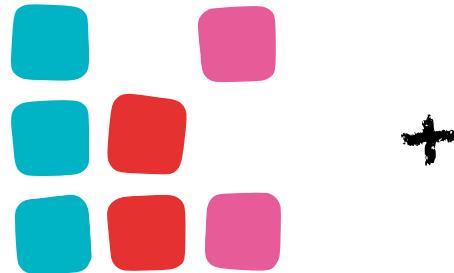
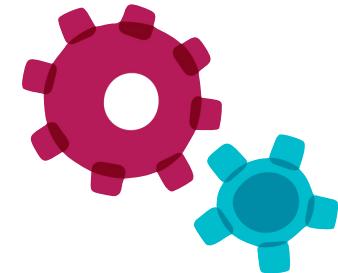


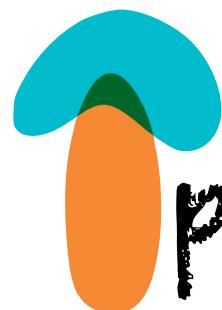
when needed

Architecture Defined

architecture =  + 

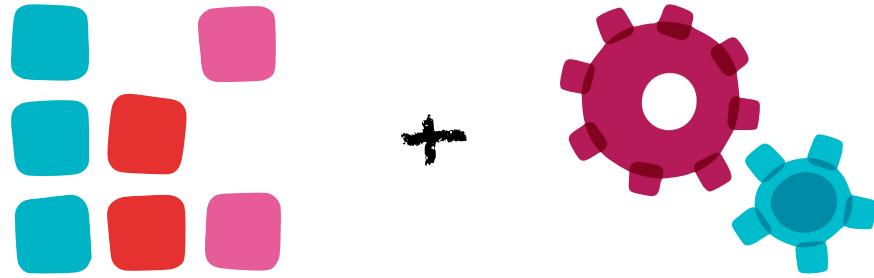
Architecture Defined

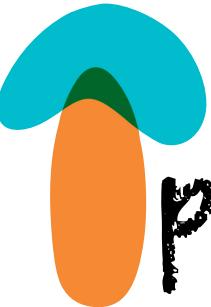
architecture =  + 



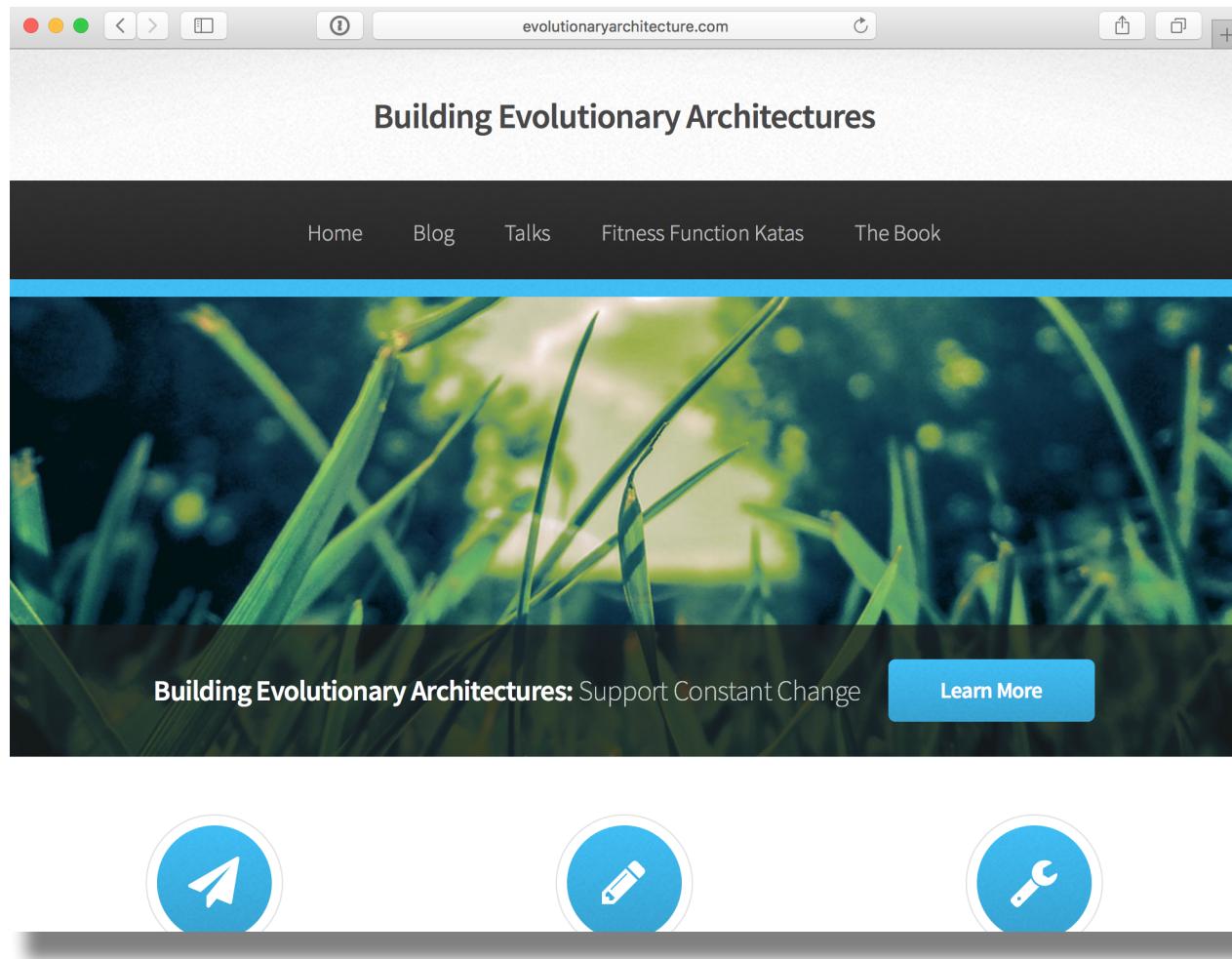
prioritization

Architecture Defined

architecture = 

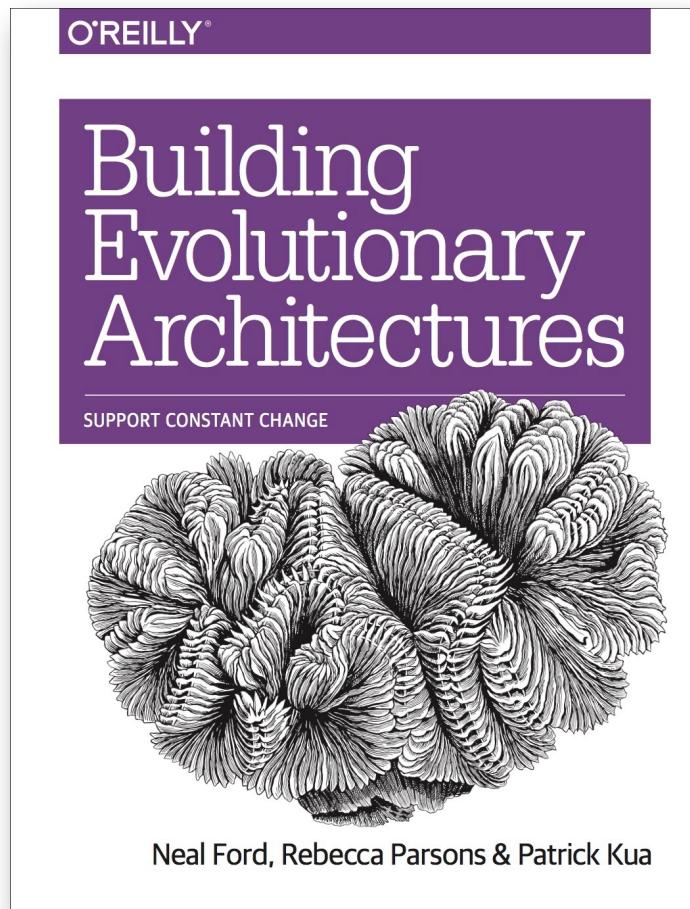
 prioritization

 cost



<http://evolutionaryarchitecture.com>

iMpLemENtiNg eVoLuTiONaRy ARcHiEcTuREs



 @neal4d
nealford.com



 @rebeccaparsons



 @patkua

