

Monoliths in a Microservices World

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OCI
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Speaker



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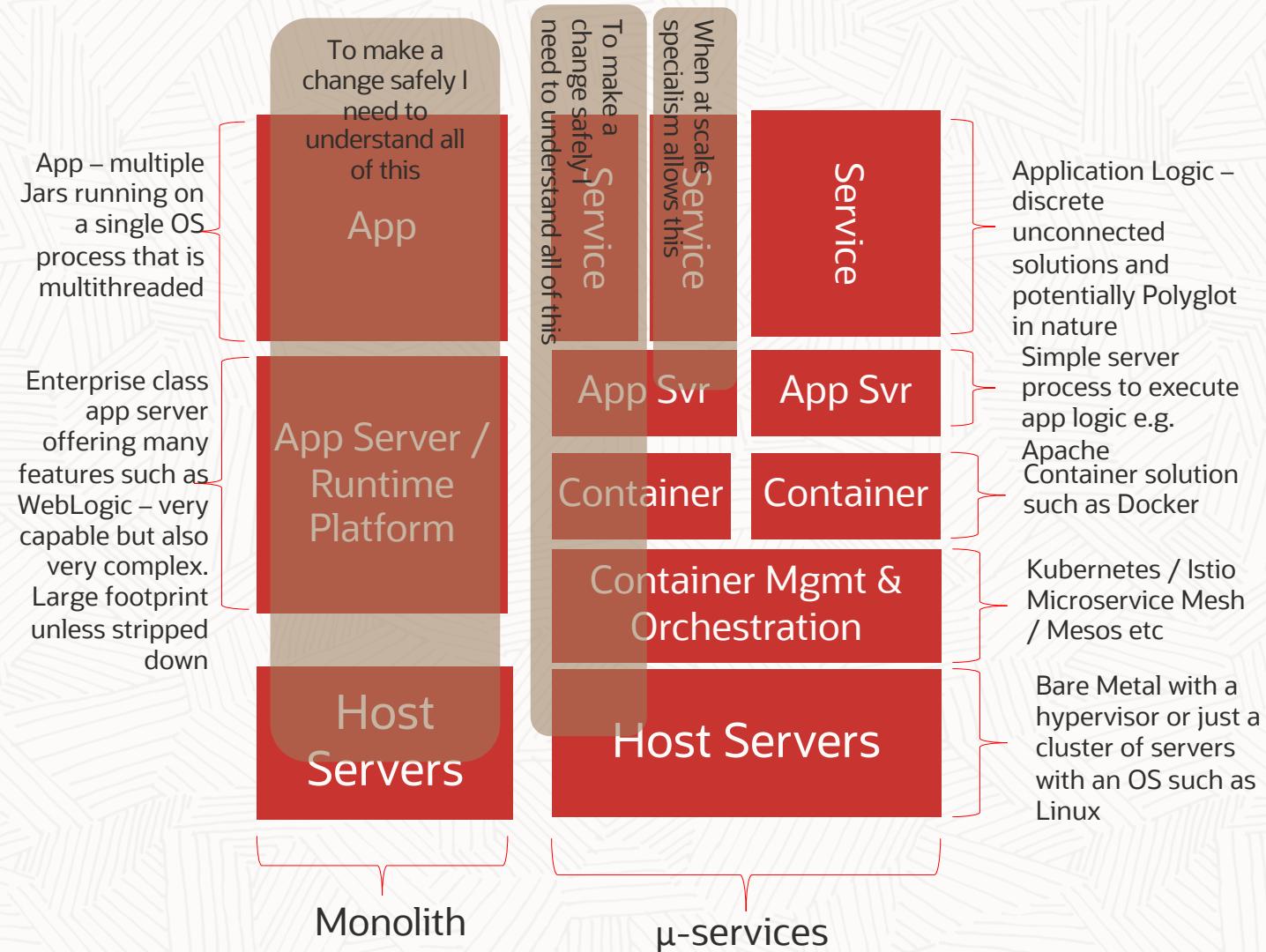




What is the driver for
 μ -services?

Development simplicity?

- Both approaches have complexity/ overhead for ...
 - Monitoring
 - Repos & deployment
 - Container/host configuration
- μ-service requires additional effort ...
 - Storage – persistent volumes, etc
 - Configs for deployment, pod definitions, config maps...
 - Automation to exploit container orchestration benefits
- μ-service simplicity comes with scale when...
 - workload is shared or re-usable
 - Automation is built & maintained



Question – does something need simplifying, when should we introduce more abstraction?

Greater productivity?

- Martin Fowler made the case that the benefit of μ -service relates to the underlying solution complexity
- Gartner has posited the idea of μ -apps as a trade-off
 - Less fine-grained than μ -services
 - Leverage containerization
 - Simplified use of App servers

Question – How do we decide if whether we can and should transition?

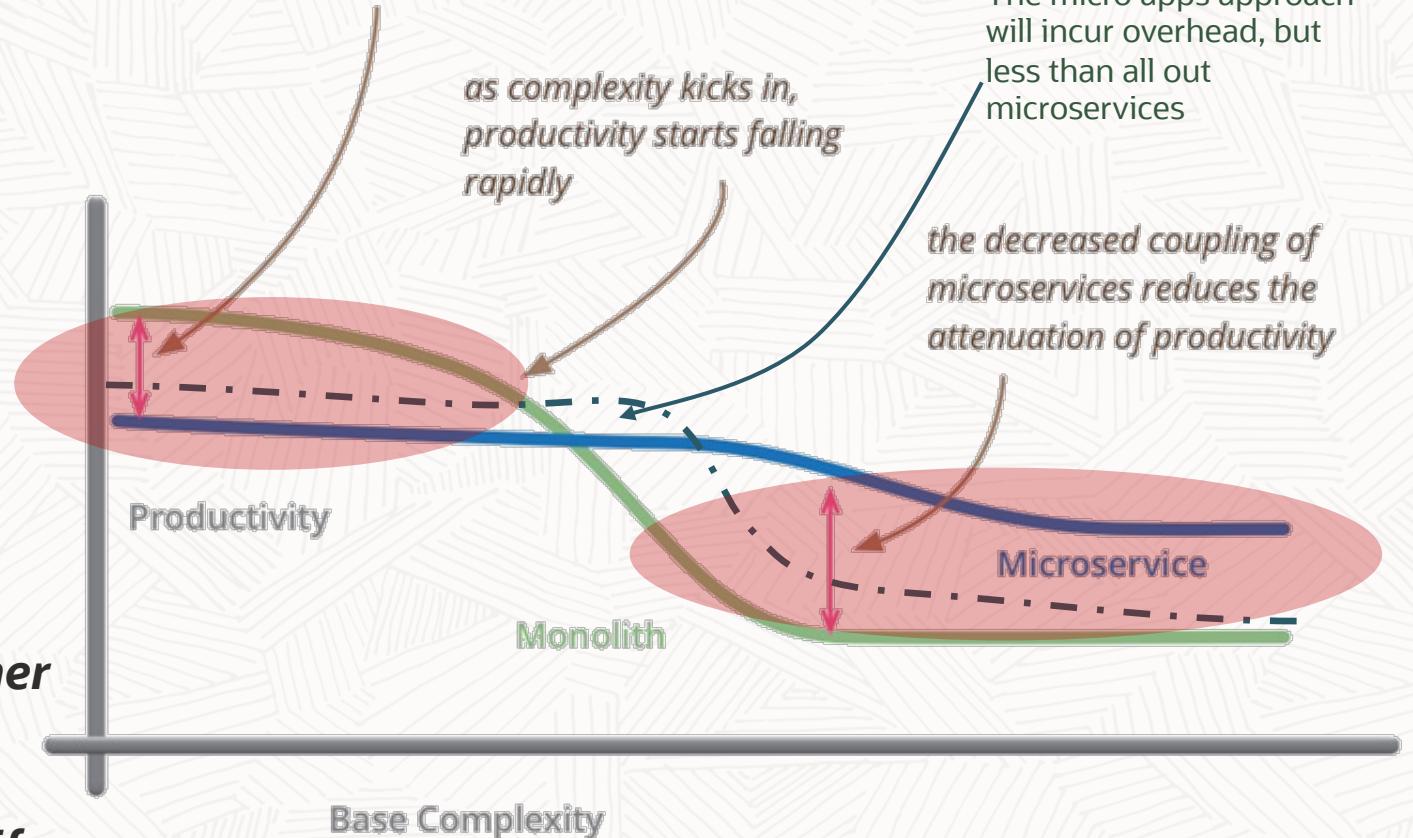
μ -service needs engineering discipline – if we have that culture – then from the outset – will this give us longer as an operable monolith?

for less-complex systems, the extra baggage required to manage microservices reduces productivity

as complexity kicks in, productivity starts falling rapidly

The micro apps approach will incur overhead, but less than all out microservices

the decreased coupling of microservices reduces the attenuation of productivity



Martin Fowler
<https://martinfowler.com/bliki/MicroservicePremium.html>

but remember the skill of the team will outweigh any monolith/microservice choice

To work with development processes – Dev |Git|AI|Sec| Ops ?

- μ-services is an architectural principle – not tools or processes
- {x}Ops is an organizational approach, processes supported by tools
- It is easy to link to {x}Ops with microservices as they've evolved in the same timeframe
- μ-services complexity have driven {x}Ops requirements
- People also confuse CI/CD with {x}Ops

Question – What prevents us applying these ideas to our existing solutions?



When looking at µ-services – have we related back to our biz needs?

- **Are we being slowed down?**
 - Is the development process ineffective?
 - Code is maintainable – changing architecture wont fix this
 - Are the governance controls and organizational decisions the source of breaks on deployment speed?
- **Ability to modernize at lightspeed?**
 - Apply change and improvement
 - Meet new business needs
- **Scalability – what scaling demands exist?**
 - Is demand really unpredictable (or is it the business and IT not communicating)?
 - Demand fluctuates unpredictably – automate and dynamically respond – when should we stop the scaling?
- **Resilience what do we want?**
 - Consider monitoring and prevention → as prevention is always better than cure
 - Secure and safe

Question – What are we looking for with software development?



Challenges of adopting μ -services

Culture

- Your strategy may be to build and deliver through microservices BUT
...
• If your culture isn't oriented to support the ways of working to be effective e.g.
 - No collaboration for cross-cutting concerns
 - Tech silo rather than domain aligned
- Microservices without a culture of automation will be like spinning plates



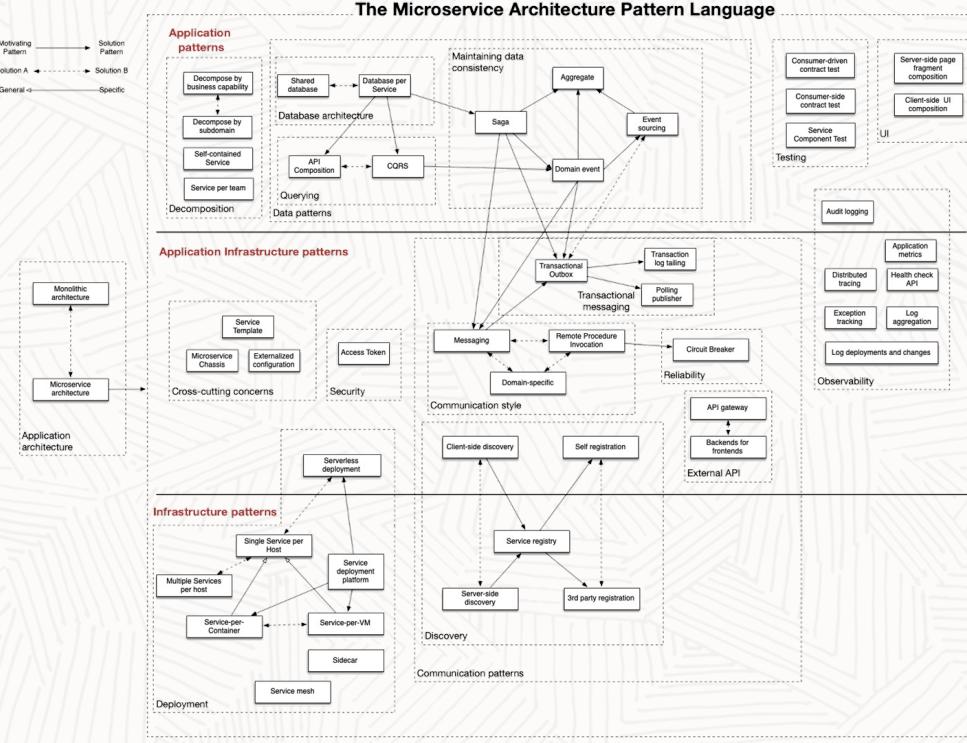
Culture eats strategy for breakfast

-Peter Drucker

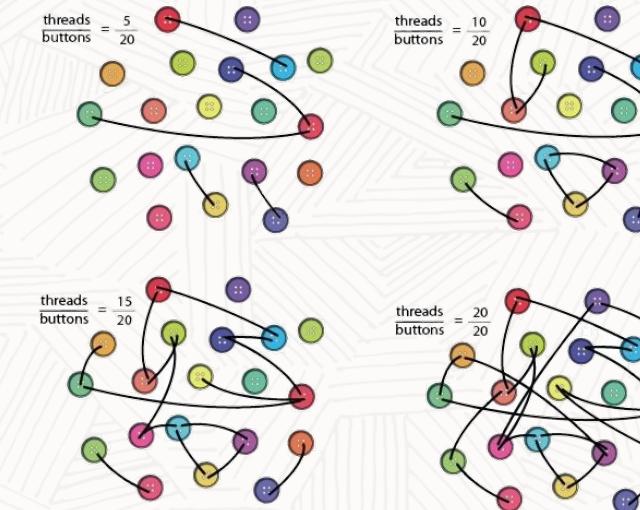
 NewAgeLeadership.com

Design complexity

- Distribution will result in more layers
- Abstraction and separation of layers – increases complexity
 - The smallest component is the simplest
 - The big picture becomes more complex
- Whatever we do we still need to address
 - Data consistency & integrity
 - End-to-end understanding of what is happening – as more different parts are involved
- Increased re-use means potential for greater impact for change
- Big ball of mud + μ -service = Big ball of mud²



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Learn-Build-Assess Microservices <http://adopt.microservices.io>



<https://androidkhunter.wordpress.com/2017/03/10/the-big-ball-of-mud-antipattern/>

Skills

- Operational tooling and processes
 - DevOps
 - Automate as far as ROI allows
- Understanding of many layers
- Development can become polyglot
 - but how polyglot can you manage
- Polyglot development means differing development processes
- Organization – make sure Conway's law isn't going to bite
- There is no substitute for good engineering practices

- Multiple development languages
- Multiple libraries & lib config



- Multiple runtimes e.g. micro profile
- Authz frameworks
- Service Mesh – Istio/Linkerd etc
- Async comms options (Kafka)
- Certificate management
- Container technologies
- Docker
- Open Container Initiative
- Kubernetes and its APIs
- Networking (Flannel, Calico), IP management, load balancing
- Storage (CSI, Portworx etc)
- OS optimization
- OS security with CSA, NIST etc



- Grafana
- Prometheus,
- Analytics platforms
- Alerting & Notification channels





Ways to Fail At Microservices

Microservices is undoubtedly one of the alluring buzzwords today that claims to help businesses develop agile, decoupled, scalable, and distributed apps, allowing programmers to work simultaneously on different functionalities and releasing updates without affecting the entire application.

Considering Microservice a Silver Bullet

Before taking advantage of microservices, you must know it is NOT a silver bullet. So, you will have to deal with several challenges, such as overcoming design complexity, compromised security, achieving data consistency, the need for testing and monitoring, team expertise, and increased operational complexity.



Not Understanding Overheads of Microservices

There are a lot of overheads in microservices and not considering them is another way to ensure your failure. These overheads come in several forms including error handling, inter-service communication, service discovery, load balancing, distributed logging, API Gateway, monitoring, failover, security, testing, and circuit breaker.



Underestimating Microservices' Complexity

Most of the time, development and project management teams underestimate microservices' complexity. Like any other software development architecture, microservices also require a productive environment. But, with the expansion of services in the system it becomes difficult to run application subsets on one machine.



Interchanging Distributed with Decoupled

If you are changing one microservice in the system, it should not break another. By far, it



The First Rule of Building Microservices: Don't Build Microservices

J. TOWER | APRIL 18, 2022

"Don't confuse architectural elegance with business value. In other words, microservices are discussed loudly and often amongst architects and developers, with little regard for the business."

—Ross Garrett

μ-Service – a challenging & risky journey



Kelsey Hightower

@kelseyhightower

I was off by a few years. [twitter.com/kelseyhightower...](https://twitter.com/kelseyhightower)



James Hickey @jamesmh_dev · Apr 27

2018: "How to split your monolith into microservices"

2023: "How to consolidate your microservices back into a monolith"

5:23 PM · Apr 27, 2023 · 85.1K Views

I remain convinced that it is much easier to partition an existing "brownfield" system than to do so upfront with a new, greenfield system. You have more to work with. You have code you can examine, you can speak to people who use and maintain the system. It looks like – you have a well-defined system, it's easier for you to know what's wrong or been too aggressive in the process.



The main drivers for container-based development

40%

Career progression in-house or externally

30%

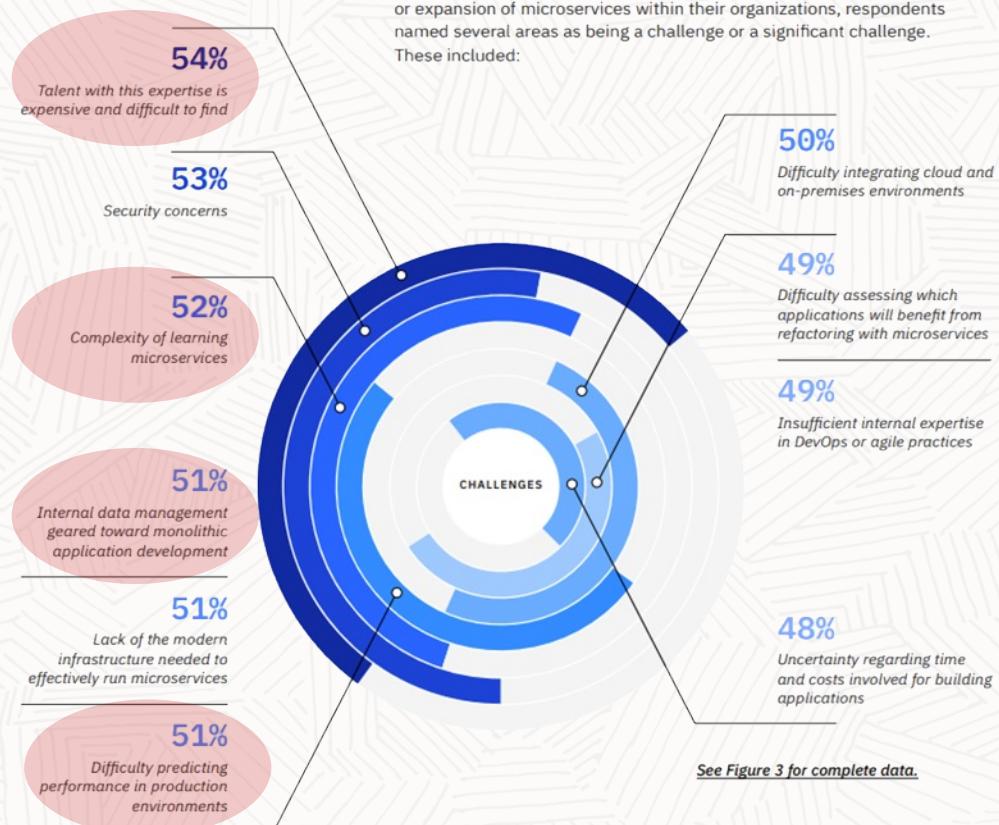
New types of application service

19%

Better support for business groups

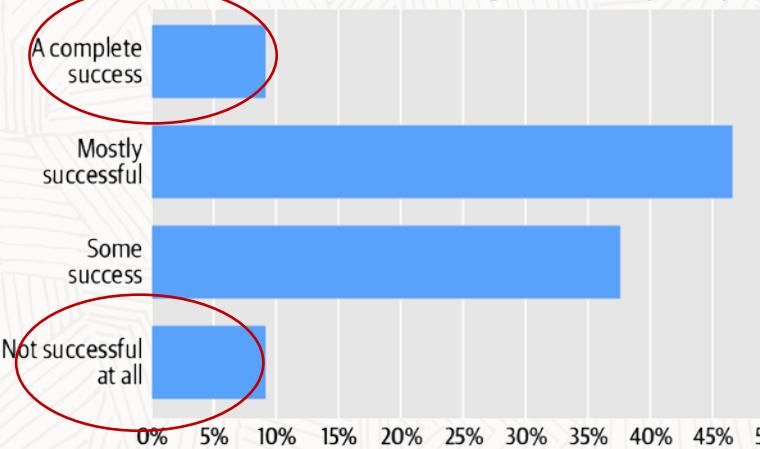
CCS Insight and Red Hat study among 338 IT professionals delivering software and containers.

Experience from using μ-services

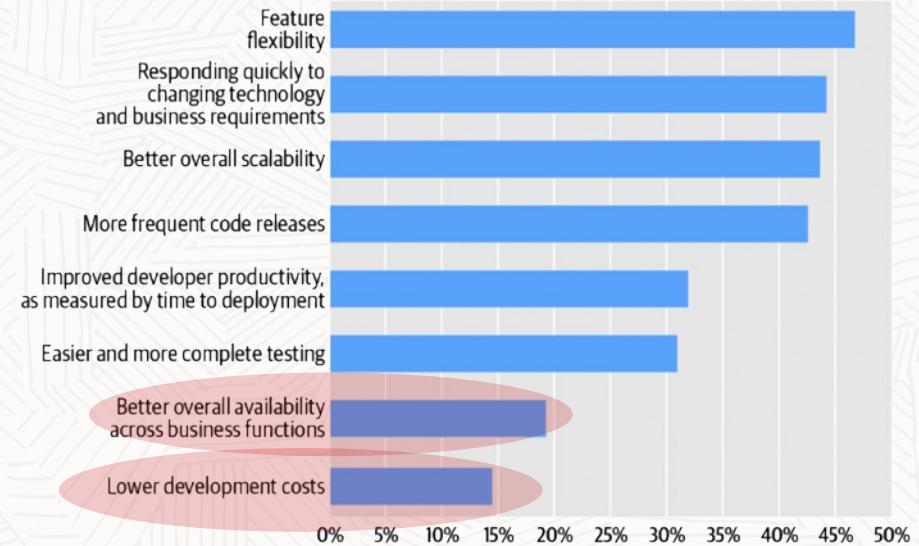


<https://www.ibm.com/downloads/cas/OQG4AJAM>

Of those systems with a microservice architecture, how do you rate the success in terms of seeing the benefits you expected?

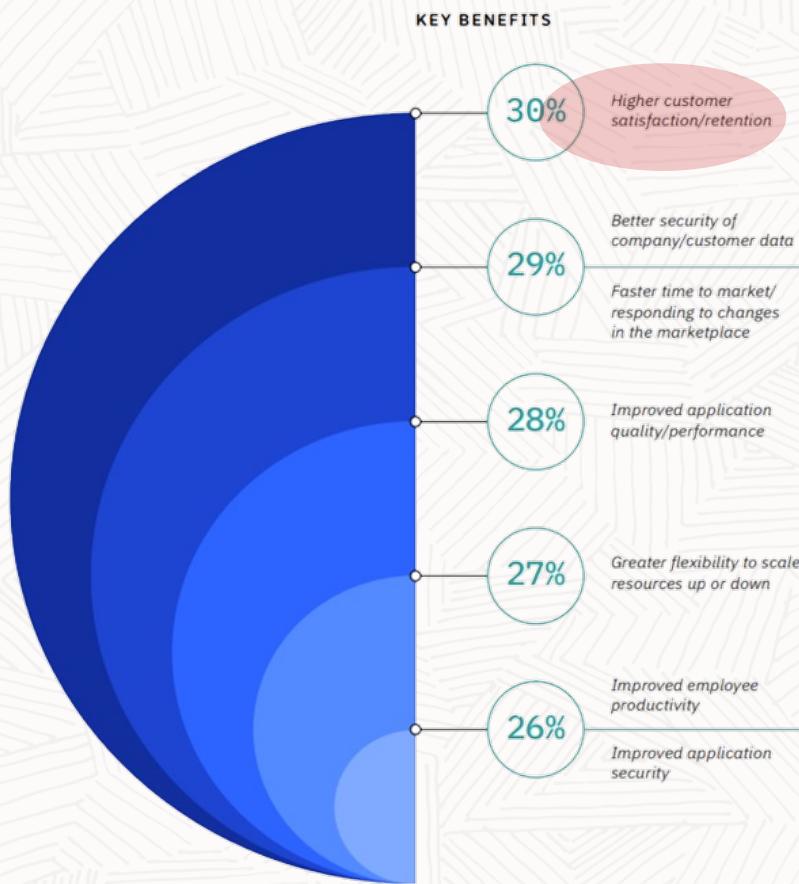


What benefits, if any, has your organization experienced from moving to microservices? (select all that apply)



<https://www.oreilly.com/radar/microservices-adoption-in-2020/>

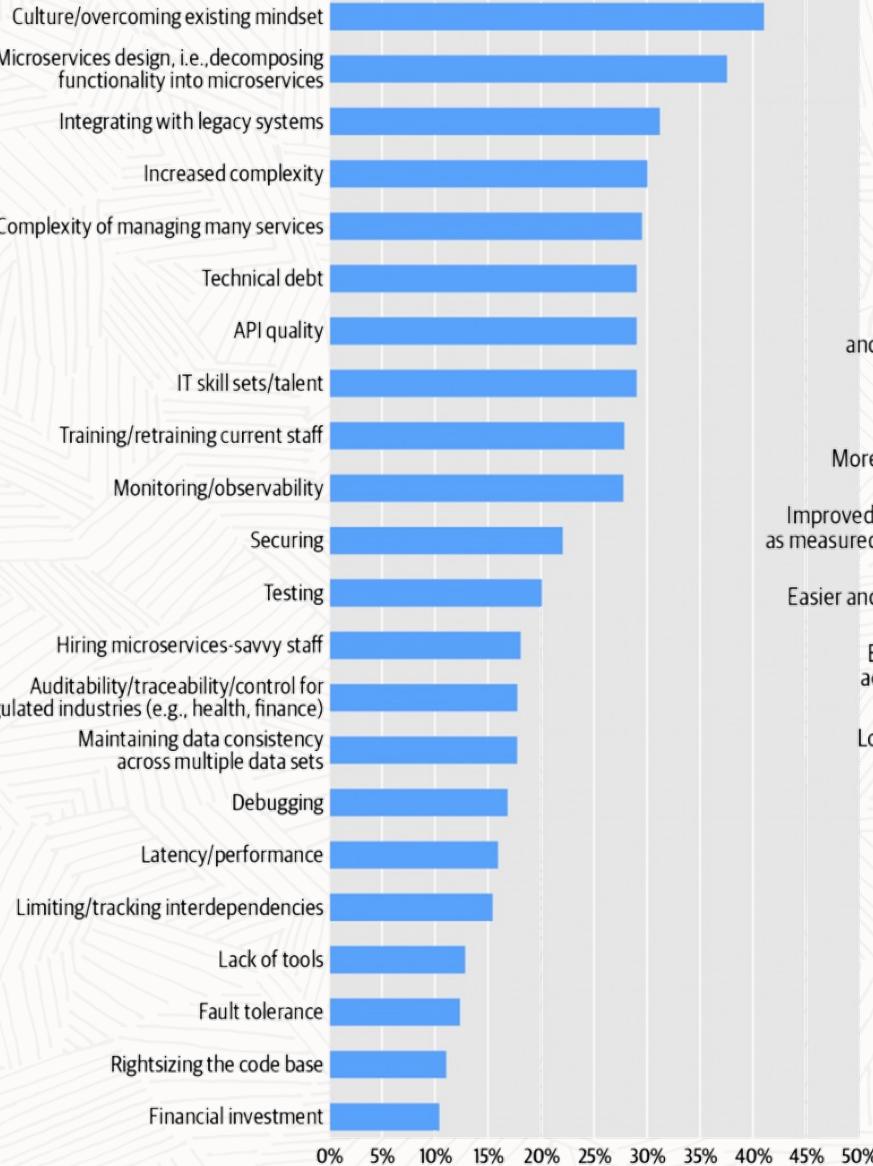
The experience reported ...



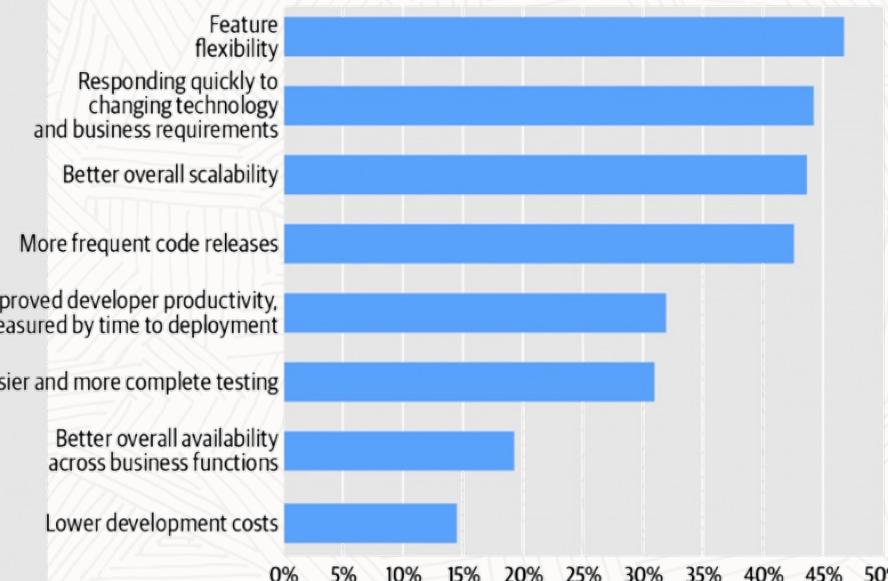
Microservices in the enterprise, 2021: Real benefits, worth the challenges

<https://www.ibm.com/downloads/cas/OQG4AJAM>

What are the biggest challenges your organization faced when adopting microservices? (select all that apply)



What benefits, if any, has your organization experienced from moving to microservices? (select all that apply)



<https://www.oreilly.com/radar/microservices-adoption-in-2020/>



μ -services and
back

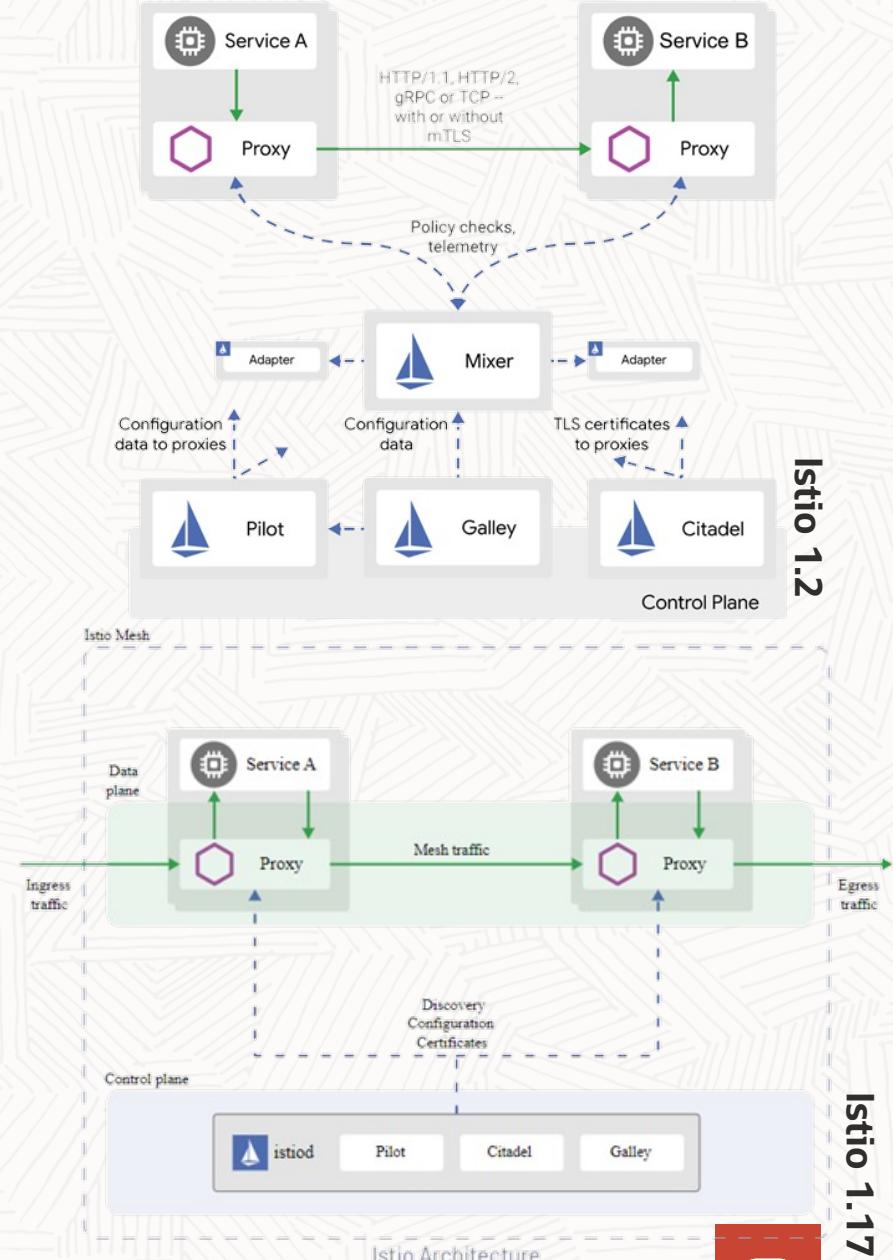
Istio becomes monolithic Istiod

Separate services of ...

- Pilot (Traffic Management)
- Citadel (Certificates & Secrets management)
- Galley (Configuration management)
- Mixer (Policy & Telemetry – *deprecated as part of v1.5*)

Consolidated into Istiod, providing all the capabilities of Pilot, Citadel & Galley.

- Proxy's talk to daemon on the control plane.
- Modular design maintained



Real-world example - Segment

Segment – a data analytics platform, now part of Twilio

- Adopted microservices to help with fault isolation and aid observability
- Saw initial benefits in delivery, but ...

Problems came from

- Operational overhead of the microservices
- Many services had a functional commonality – addressed by building libraries, BUT that slowed development – testing took longer
- Forking code base undermined maintainability

Consolidated this area of code – based found the still have productivity and high performance

"If microservices are implemented incorrectly or used as a band-aid without addressing some of the root flaws in your system, you'll be unable to do new product development because you're drowning in the complexity."



<https://www.infoq.com/news/2020/04/microservices-back-again/>
Thanks to Alexandra Noonan for sharing the story

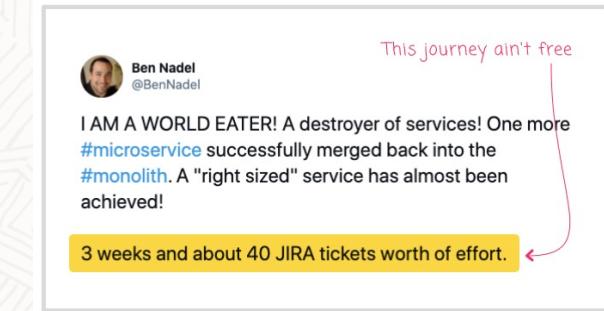
Real-world examples

ShopKeep (part of Lightspeed)

- Classic microservices story – building monolith – worked fine until hit issues of scaling
- 1st attempt failed –
 - Didn't get properly grasp challenges that monolith had
 - If monolith architecture has lost cohesion and quality – what chance will you microservices have?
- 2nd time around –
 - Tried to bite too much off at once
 - Partitioned the wrong way – resulting in tightly coupled services



Thanks to Paddy Carey for sharing the story
<https://www.youtube.com/watch?v=0jODVkkwiMc>



Thanks to Ben Nadel for sharing the story
<https://www.bennadel.com/blog/3944-why-i've-been-merging-microservices-back-into-the-monolith-at-invision.htm>

Amazon!!

- Some of these headlines are a bit clickbait BUT
- Background ...
 - Needed service to examine video for encoding & audio sync errors
 - Solution too slow & costly
 - Elected to use Lambda and Step Functions
 - Organization with a culture that gets microservices
- In my opinion ...
 - Technology before design – wrong way around
 - Cost issues could have been spotted with a bit of strategic thinking

The image shows two articles from Medium. The top article, titled "Amazon Prime Video reduced costs by 90% by ditching Microservices", is sponsored by the "World Monolith Supremacy Association". It is written by Devansh- Mach Learning Made. The bottom article, titled "So many bad takes—What is there to learn from the Prime Video microservices to monolith story", is written by adrian cockcroft. Both articles have a "3 min read" duration. The background of the image features a repeating geometric pattern.

5 min read

Amazon Prime Video reduced costs by 90% by ditching Microservices

This article is *not* sponsored by the World Monolith Supremacy Association

Devansh- Mach Learning Made

3 min read

So many bad takes—What is there to learn from the Prime Video microservices to monolith story

So many bad takes — What is there to learn from the Prime Video microservices to monolith story

adrian cockcroft

adrian.com.medium.com

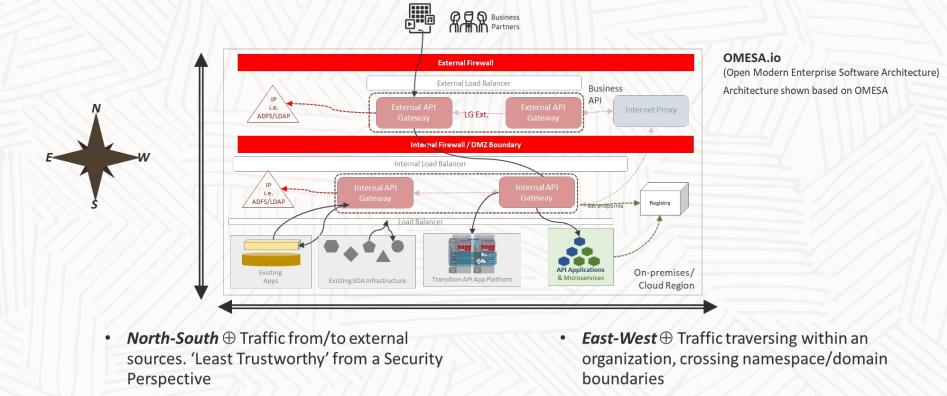


*Strategies to
minimize monolith
challenges, Cohabit
& transition*

Internal API Gateways and Message brokers – Enabling Anti-corruption layer to help protect modularity

We can consider using internal API gateway(s) to ...

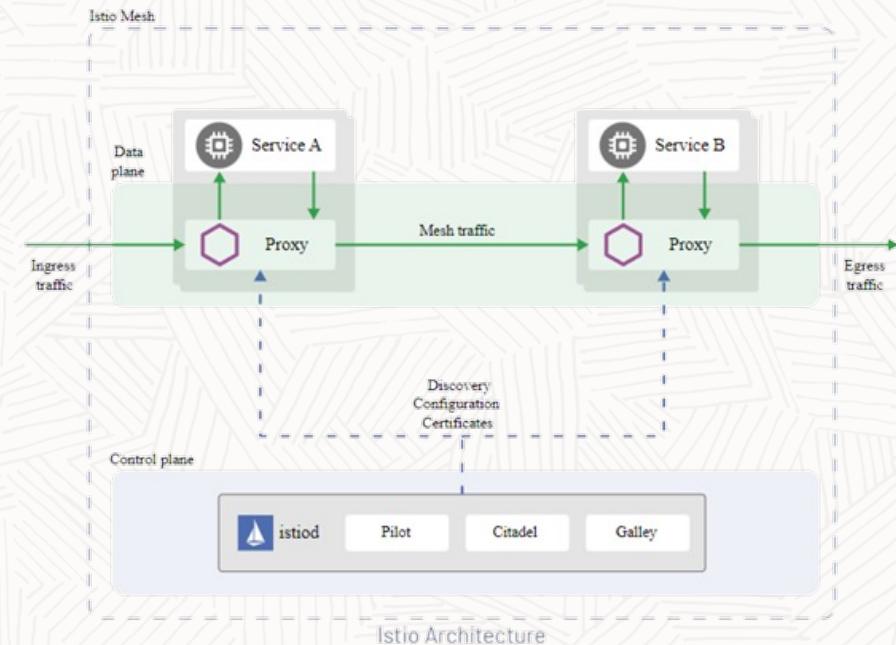
- Enforce rate limiting to avoid possible runway processes swamping you with API calls
- Capture usage data for billing, cross-charging, and demand forecasting
- Creating points of abstraction
 - Gateways can mask changes in deployment for consumers
 - Enforce loose coupling – some APIs are intended operational purposes NOT for others to build new applications against
- Gateway as a focus of security management
- Provide easier points for measuring utilization (investment value)
- Use of Gateway can be used to support ...
 - Enforcement of design & development approaches
 - API First (developing contract visibility etc)



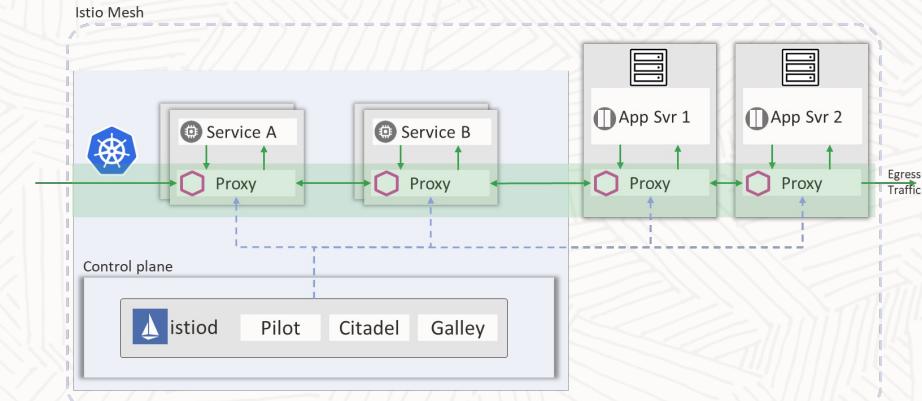
Service Mesh proxy for monoliths

- Service mesh helps development & operations by ...
 - Abstracting and routing traffic between end-points
 - Securing traffic between endpoints (Authz, encryption ...)
 - Observability & monitoring
 - Extensibility - Extend proxies with WASM
- Nothing here unique to a μ-services, so...
 - Deploy Envoy proxy in front of Monolith
 - Proxy needs to talk to **Istiod**
 - Monolith will appear to all services in the same manner
- This strategy is well-developed and proven
 - BookInfo demo app includes Istio with a VM deployment
 - Standard Istio documentation includes VM deployment guide
 - Reference case with [Bluecore](#)

Typical Istio architecture ...



Istio architecture with Monoliths ...



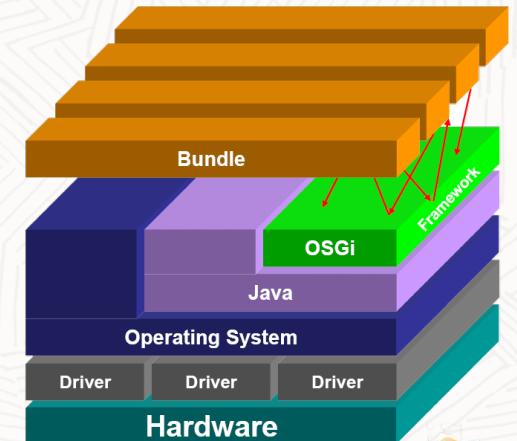
Good design aka modular monolith ...

- We can still apply good design principles ...
 - Domain Driven Design
 - Design Patterns such as Inversion of Control
 - API First
- Exploit language modularization features and decoupling
 - OSGi (Apache Felix, Celix ...)
 - Python packages
 - Go Modules
- Automate, automate, automate ...
 - Just because we're not deploying as small microservices doesn't mean we can't reap the rewards of automation
 - Load balancing + active monitoring instead of Kubernetes health management

 Kelsey Hightower  @kelseyhightower ...

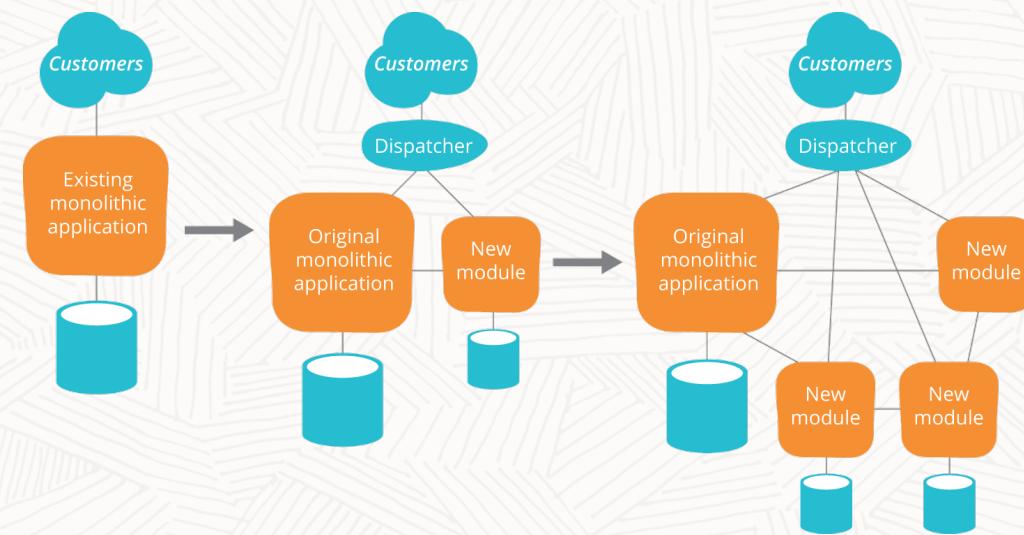
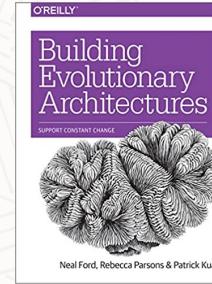
I recommend keeping your business logic as modular as possible, you can break it up across multiple repos and packages if you really want, but packaging those components as a monolith offers a serious reduction in complexity and a simplified deployment and management process.

7:38 PM · Feb 2, 2023 · 25.6K Views



Evolutionary Architecture

- Develop and measure fitness functions – use metrics to guide incremental change
 - Metrics more than dev/unit testing
- If the organization is adversely impacting architecture – Inverse Conway’s Law Maneuver
 - Cross-functional teams
 - Inter team communication
 - Product over project
- Changes are always small increments keeping system stability.
- Identify redundant functionality/dead code and remove
- Bounded context views when overlayed with implementation will help identify journey
- Cross contexts using APIs/Messaging etc



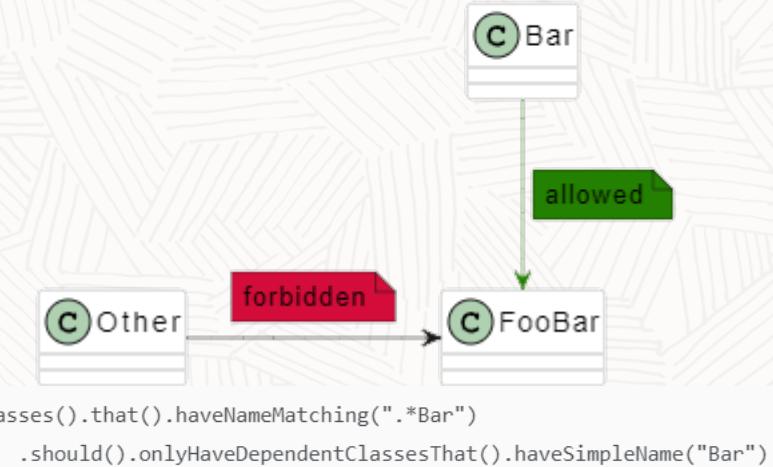
Culture of Discipline – Structured Monolith that can be (de)composed

Class Dependency Checks

Tools like ArchUnit/ArchUnitNet (xUnit extension) can be used to flag abuse of module boundaries..

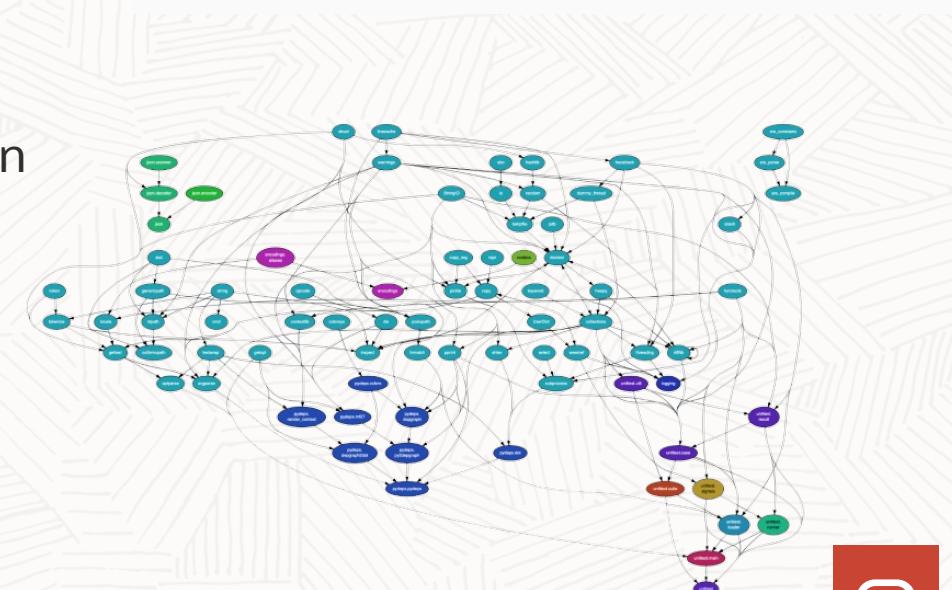
- Unit tests can ensure code modularity is respected
- Does need discipline to create tests

Tools like JDepend will help identify coupling



Software Bill of Material (SBOM) tooling to help control dependencies...

- Primary goal is to support Supply Chain issues, which can also help with modularity
- Smaller dependencies can point to control of coupling
- Needs your code to be built as modules
- Need to have SBOM analysis/visualization to help



Container Instances

- Container Instances service – available from most hyperscalers
 - Deploy solutions from a container e.g. Docker
 - Could view Container as largely an installation abstraction (i.e. replace MSI, .DEB, RPM mechanisms)
 - Include monitoring, auto restart, etc.
 - None of the complexity of K8s
- Use of containers – create the opportunity for some isolation – can serve as a stepping stone to μ -service



Adopt µ-service tools without tearing apart your monolith

- Verrazano (similar solutions VMWare Tanzu, Google Anthos etc)
 - Containers are your installation tech
 - Tools to help containerize and deploy monoliths
 - Completely Open Source – curated tech stack designed to support Monolith (e.g., WebLogic – J2EE workloads) and services
 - Deploying all the different building blocks is addressed for you e.g., Istio, Keycloak, setting up monitoring
- CNCF projects can work with Monoliths e.g.
 - Fluentd, Fluentbit – deploy anywhere (Fluentbit's origins are IoT)
 - Grafana & Prometheus can be deployed anywhere – its just software
 - So we adopt a lot of µ-service tools and techniques in a more incremental manner



Conclusion

- Applying μ -services can be hard, and failing is easy ...
 - Even the best have got it wrong
 - We think about technology – but we need to have our organization, culture ... in order
- μ -services are an **amplifier**
- μ -services aren't the goal – **business value is the goal** - μ -services is a way to get there
- You don't need to be building μ -services to benefit from cloud-native technologies
- Monoliths can cohabit and participate with microservices
- Adaption of a Martin Fowler quote – ***don't start with μ -services UNLESS there is a clear immediate business need. DO start with MODULARITY. Move to microservices when you're in good health and need it***

Monoliths are Okay **balls of mud are BAD**
 μ -services are Okay

μ -service NOT a fix
for poor practice &
org issues

ORACLE

Questions & goodies...

Thank you

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