Deconstructing the Monolith

Designing Software that Maximizes Developer Productivity

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Senior Software Engineer
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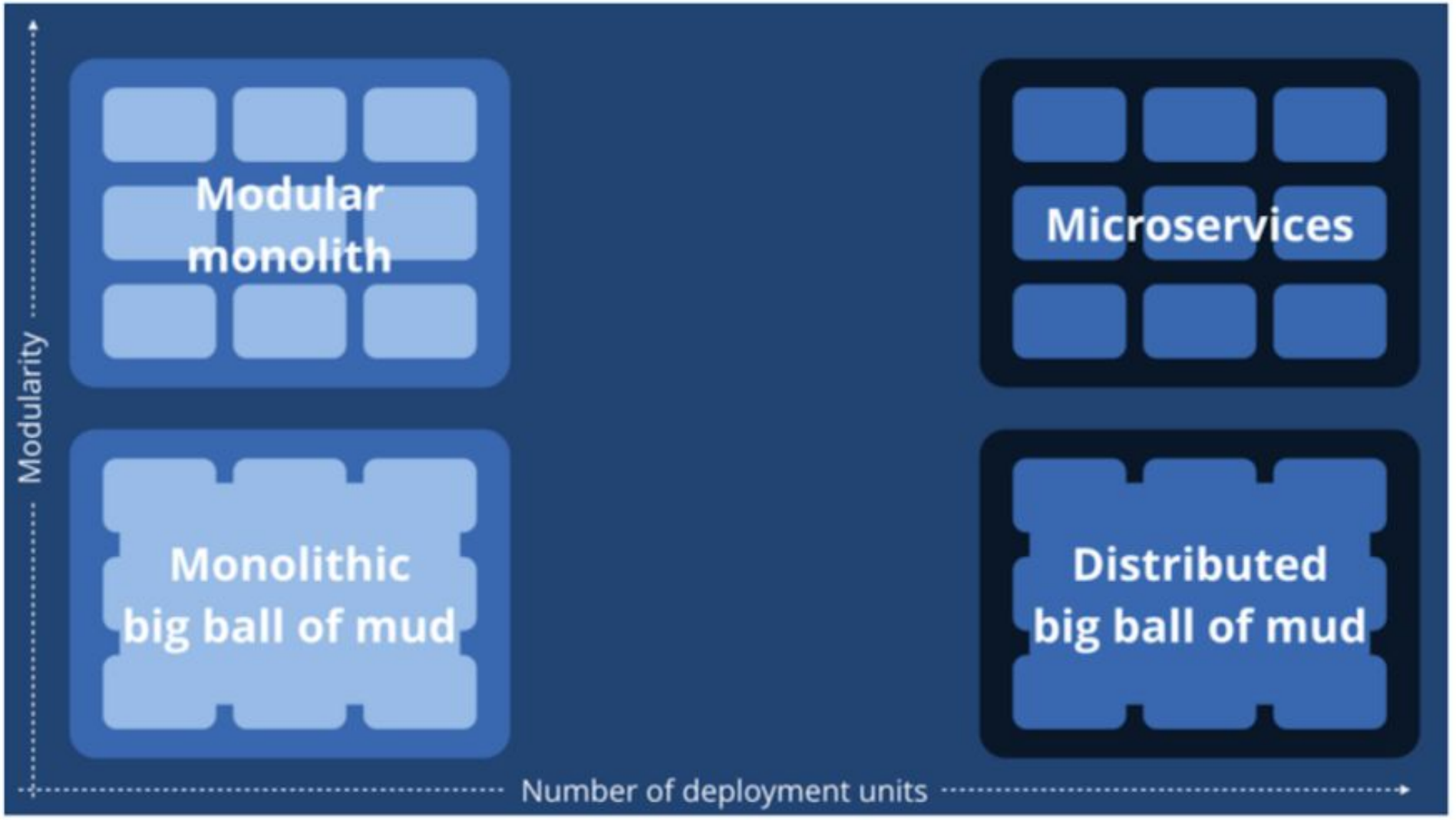
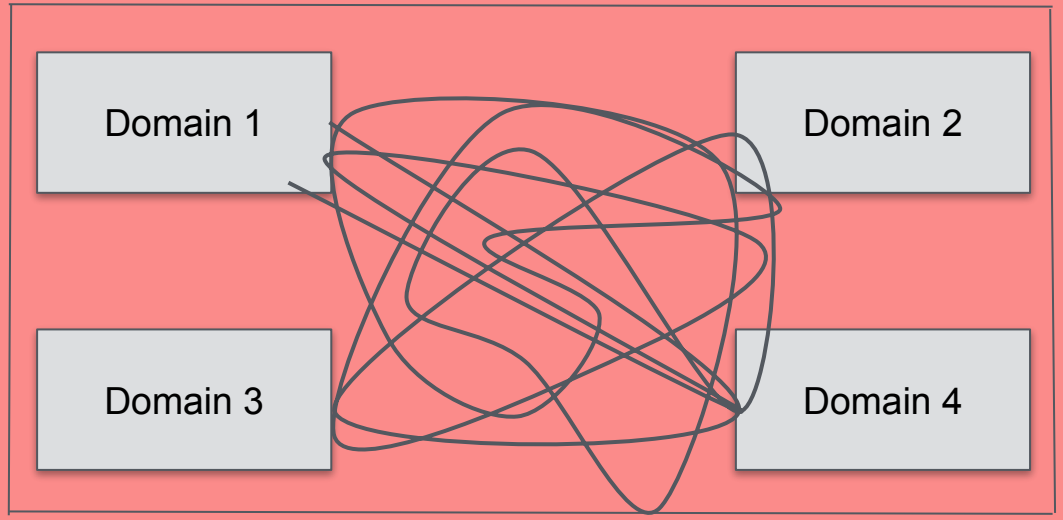

Modularity
Modular monolith
Microservices
Monolithic big ball of mud
Distributed big ball of mud
Number of deployment units

Agenda

1. Define monoliths and microservices
2. Analyze pros & cons
3. Introduce a third option
4. Conclusion: is there a *right* choice?

Monolith

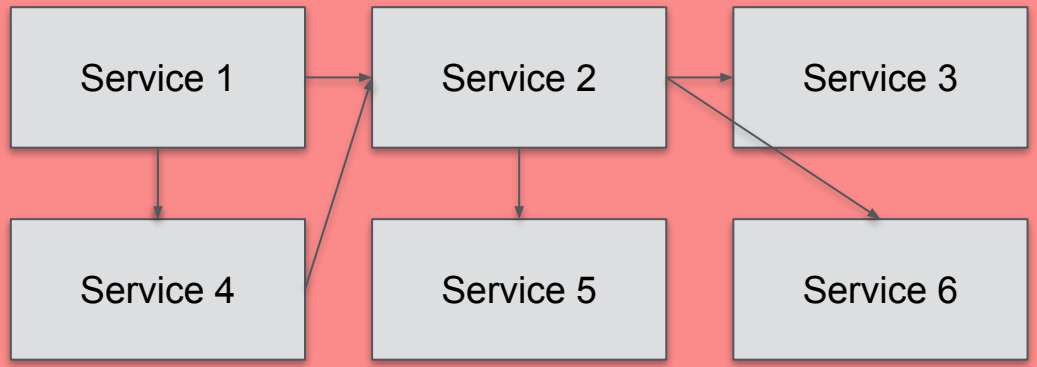


“A software system in which functionally distinguishable aspects are all interwoven, rather than containing architecturally separate components.”

Source: Wikipedia

Microservices

“Suite of independently deployable, small, modular services in which each service runs a unique process and communicates through a well-defined, lightweight mechanism to serve a business goal”



Source: Smartbear

Monoliths

Pros	Cons
• The code is all in one place • One test/deployment pipeline • All data is available everywhere • One infrastructure	• Slow tests • New code having unexpected repercussions • Need to understand the entire codebase

Microservices

Pros	Cons
• Each service is lightweight and has one clear responsibility • Individuals/teams can work on separate services • Individual systems are easily understandable • Services can scale independently	• Many different test/deployment pipelines • Infrastructural overhead for each service • Network communication needed between services • Data not always available where you need it • Large refactors can be tedious

EXPECTED BENEFITS OF MODULAR PROGRAMMING

The expected benefits of modular programming fall into three classes: (1) managerial -- development time could be shortened because separate groups would work on each module with little need for communication (and little regret afterward that there had not been more communication); (2) product flexibility -- it was hoped that it would be possible to make quite drastic changes or improvements in one module without changing others; (3) comprehensibility -- it was hoped that the system could be studied a module at a time with the result that the whole system could be better designed because it was better understood.

Department of Computer Science
Carnegie-Mellon University
Pittsburgh, Pa.

August, 1971

Source: “On the Criteria to be used in decomposing systems into modules” by D. L. Parnas

Is there a happy medium?

Modular Monolith

Monoliths

Pros	Cons
• The code is all in one place • One test/deployment pipeline • All data is available everywhere • One infrastructure	• Slow tests • New code having unexpected repercussions • Need to understand the entire codebase

Modular Monoliths

Pros	Cons
• The code is all in one place • One test/deployment pipeline • ~~All data is available everywhere~~ • One infrastructure	• ~~Slow tests~~ • ~~New code having unexpected repercussions~~ • ~~Need to understand the entire codebase~~

Microservices

Pros	Cons
• Each service is lightweight and has one clear responsibility • Individuals/teams can work on separate services • Individual systems are easily understandable • Services can scale independently	• Many different test/deployment pipelines • Data not always available where you need it • Infrastructural overhead for each service • Network communication needed between services • Large refactors can be tedious

Modular Monoliths

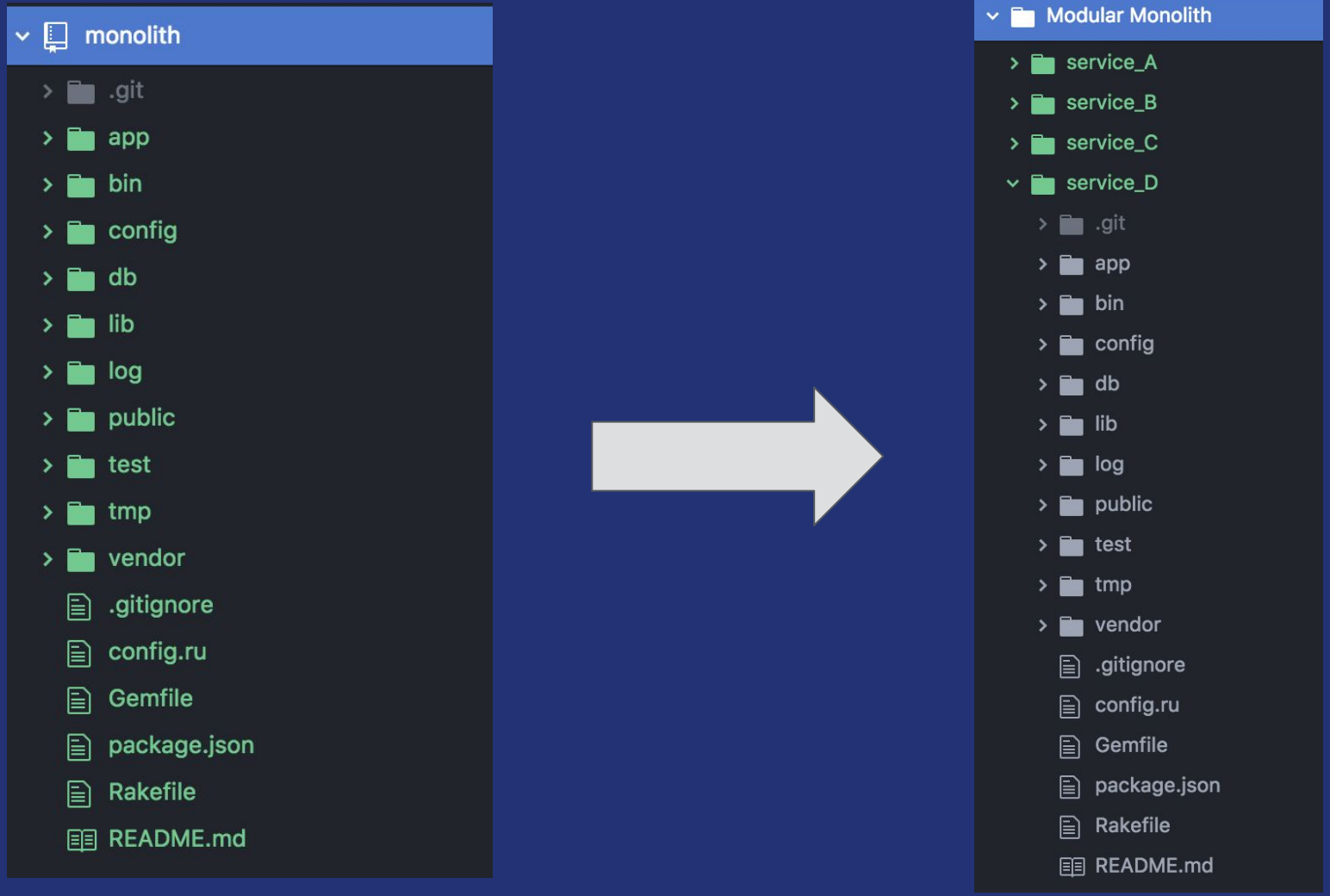
Pros	Cons
• Each ~~service~~ (module) is lightweight and has one clear responsibility • Individuals/teams can work on separate ~~services~~ (modules) • Individual systems are easily understandable • ~~Services can scale independently~~	• ~~Many different test/deployment pipelines~~ • Data not always available where you need it • ~~Infrastructural overhead for each service~~ • ~~Network communication needed between services~~ • ~~Large refactors can be tedious~~

Let’s talk implementation details

1. Namespace
2. Untangle
3. Enforce boundaries between modules

The Modular Monolith: Rails Architecture

Dan Mange


monolith
.git
app
bin
config
db
lib
log
public
test
tmp
vendor
.gitignore
config.ru
Gemfile
package.json
Rakefile
README.md
Modular Monolith
service_A
service_B
service_C
service_D
.git
app
bin
config
db
lib
log
public
test
tmp
vendor
.gitignore
config.ru
Gemfile
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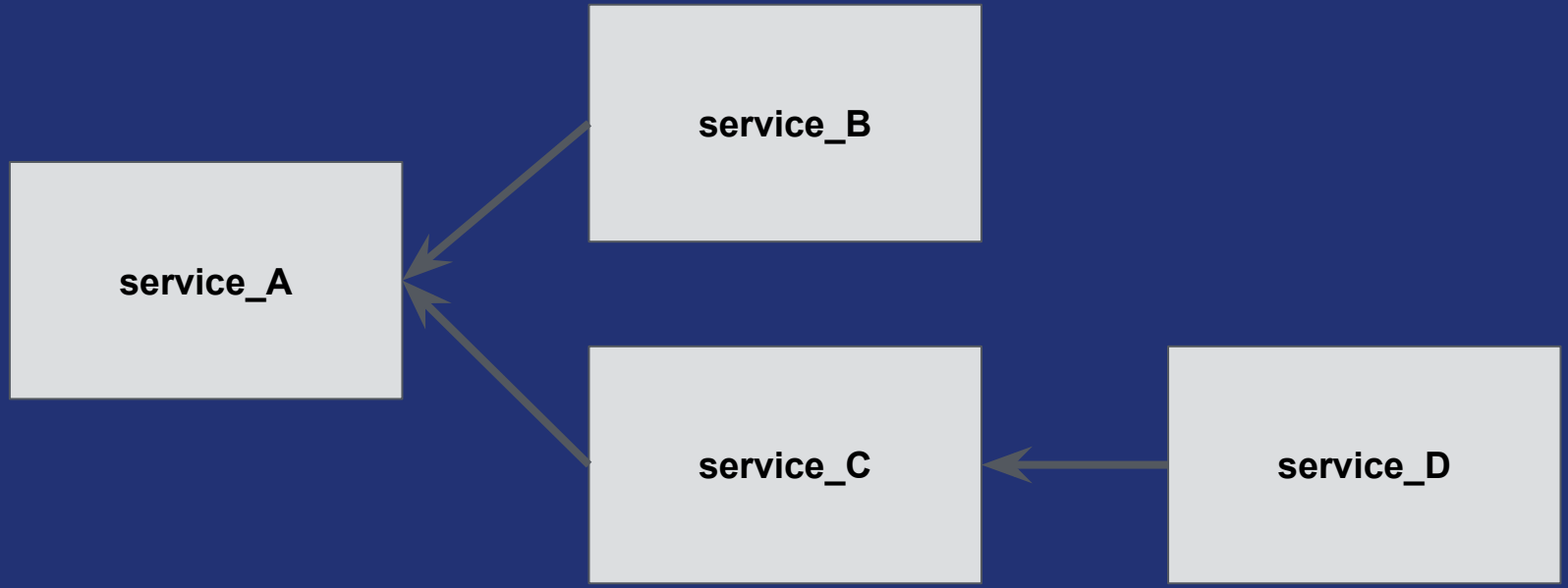
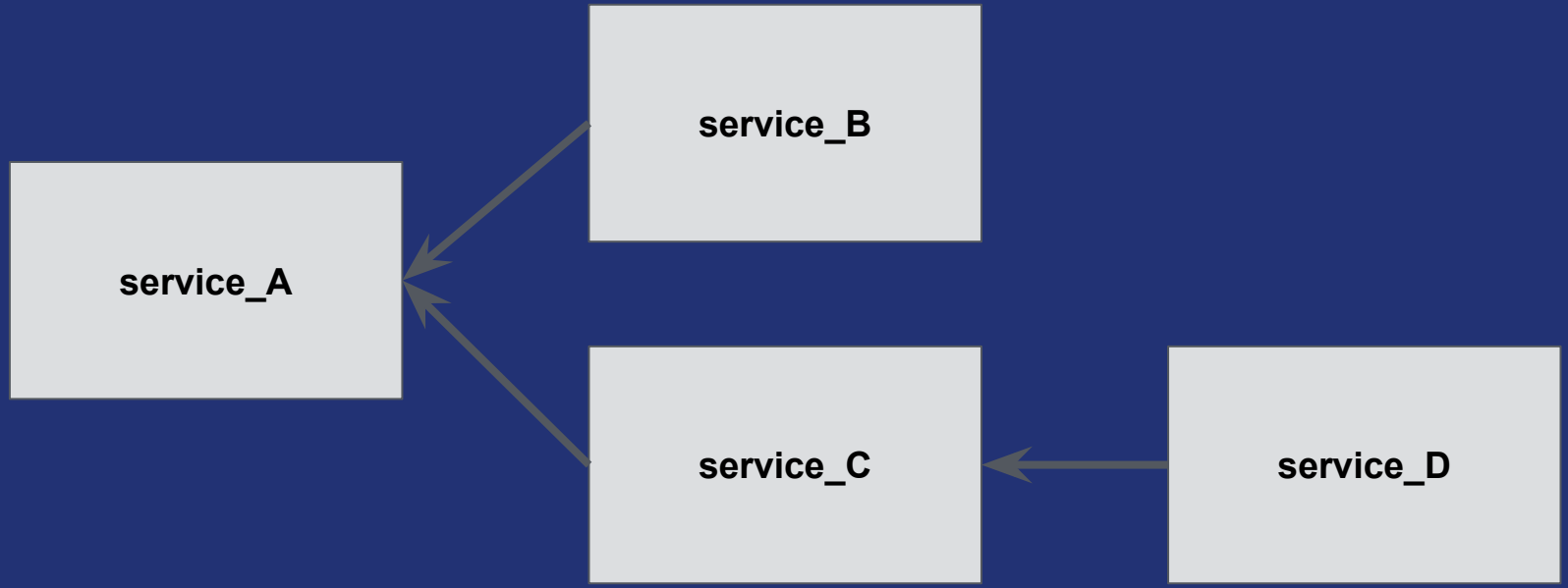
Dependency Graph



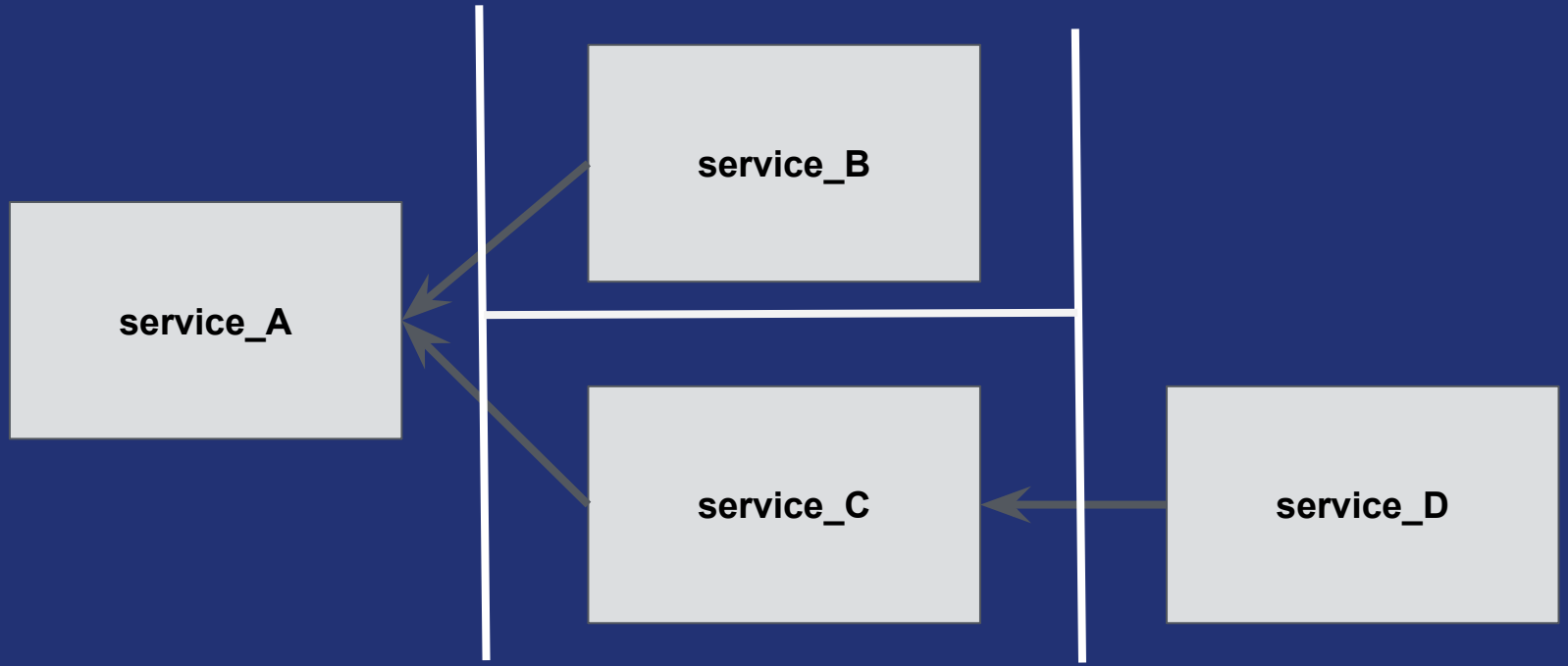
Source: Giphy

Dependency Graph



Source: 123rf

Transitioning to Microservices



Event Driven Architecture drives communication between services and enables near real-time processing.

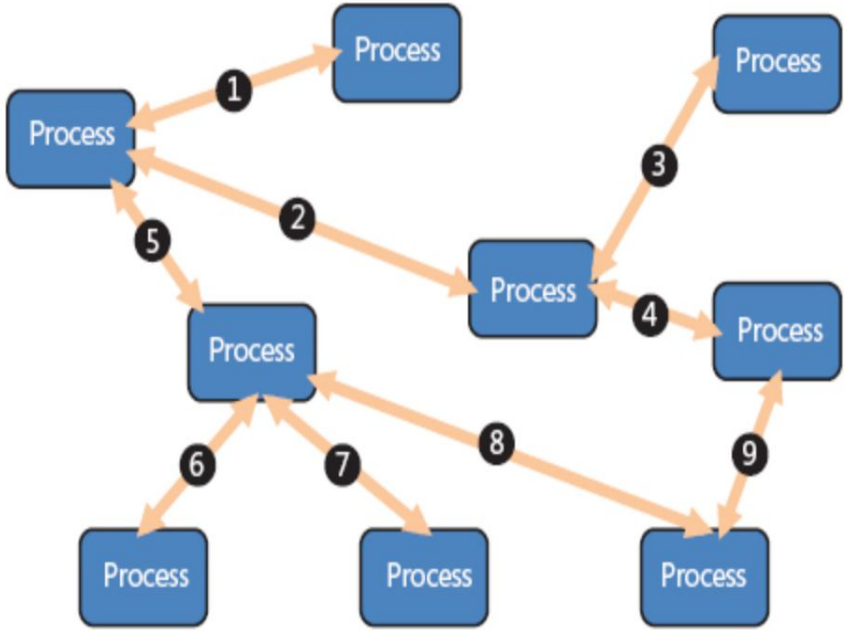


Figure 1. Request-driven architecture (logical view)

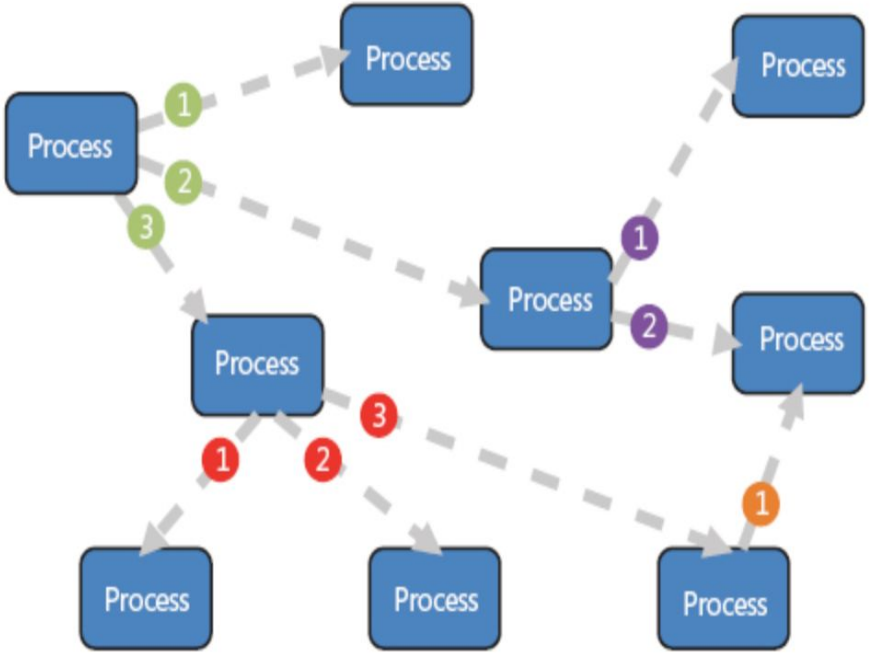
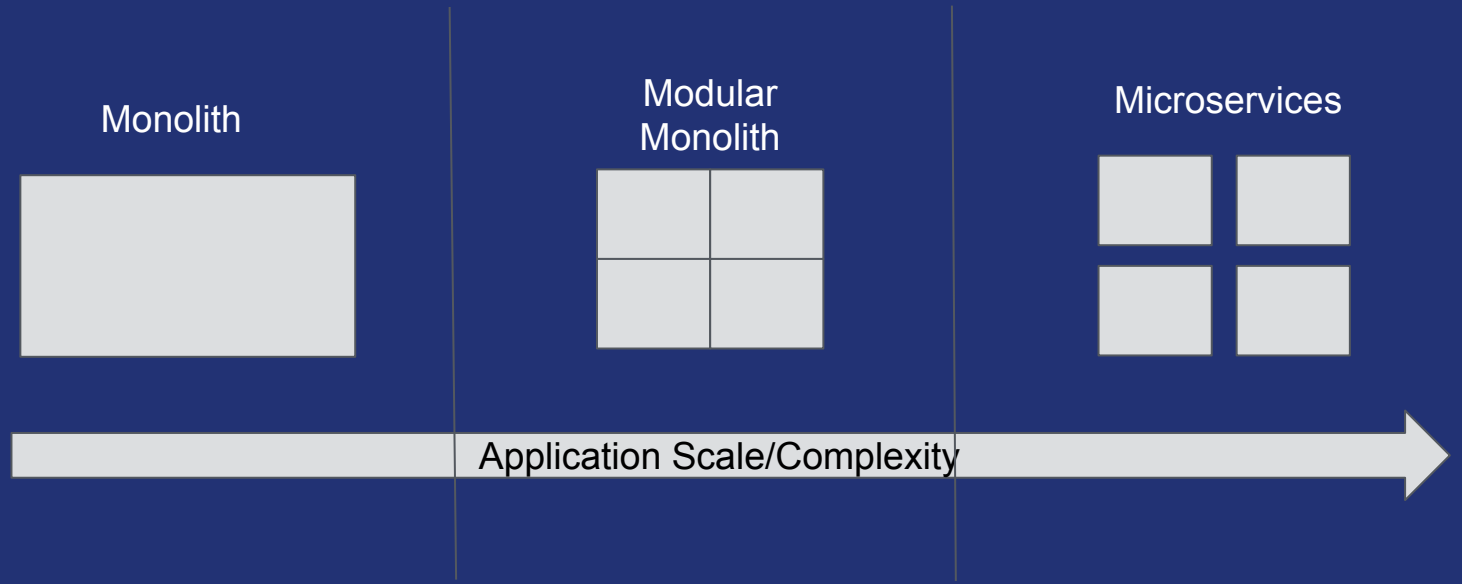


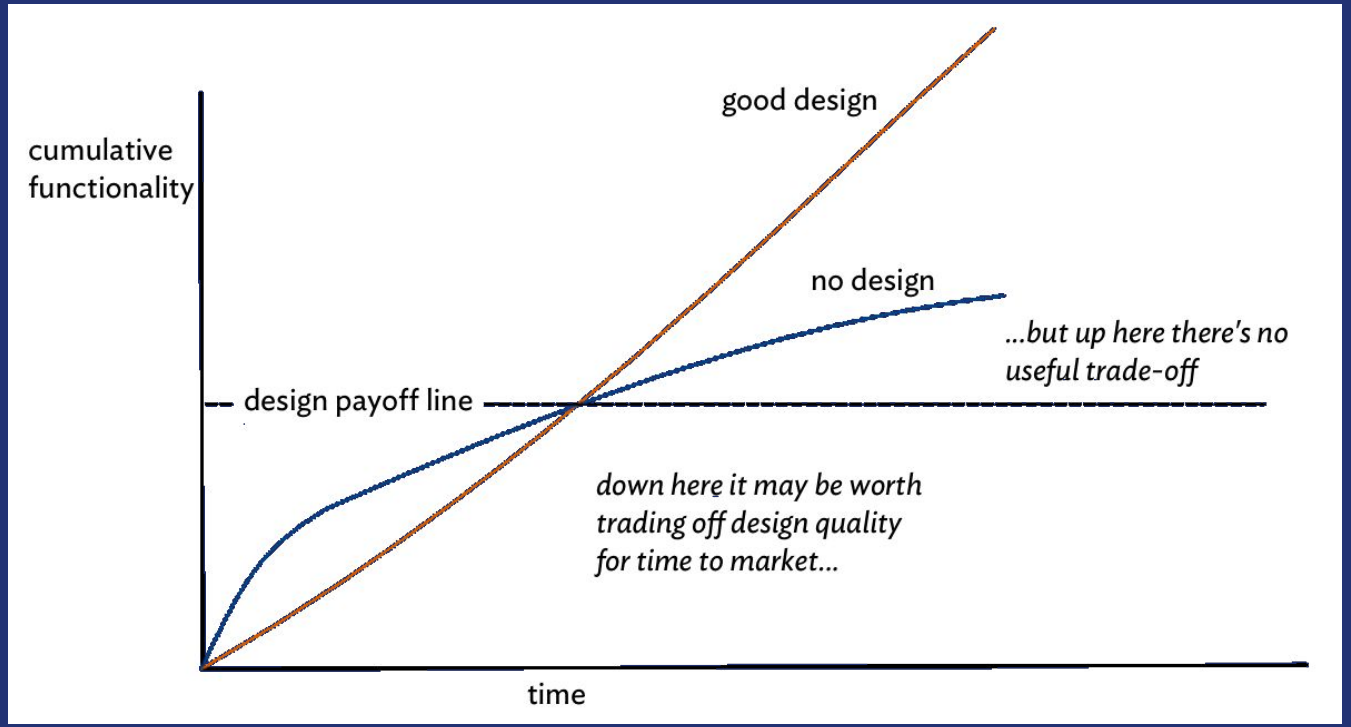
Figure 2. Event-driven architecture (logical view)

Source: Microsoft


Monolith
Modular Monolith
Microservices
Application Scale/Complexity

Design Stamina Hypothesis

Martin Fowler



Source: Martin Fowler

“When you have a hammer
Everything looks like a nail.”

- Abraham Maslow

Thanks!

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Resources

- Wikipedia: Monolithic System: https://en.wikipedia.org/wiki/Monolithic_system
- Smartbear: what are microservices? https://smartbear.com/learn/api-design/what-are-microservices/
- Carnegie Mellon University: “On the Criteria to be used in decomposing systems into modules” by D. L. Parnas https://repository.cmu.edu/cgi/viewcontent.cgi?article=2979&context=compsci
- Medium: The modular monolith by Dan Menge https://medium.com/@dan_manges/the-modular-monolith-rails-architecture-fb1023826fc4
- Giphy: Boundaries https://media.giphy.com/media/26tn42f4M1jbuAMM0/giphy.gif
- 123rf: Red stop icon https://www.123rf.com/photo_89037069_stock-vector-red-stop-icon-on-transparent-background-no-symbol-vector-illustration.html
- Microsoft: Using events in highly distributed architectures https://msdn.microsoft.com/en-us/library/dd129913.aspx
- Martin Fowler: The Design Stamina Hypothesis https://martinfowler.com/bliki/DesignStaminaHypothesis.html
- Lean IX: 2017 Survey https://cdn2.hubspot.net/hubfs/2570476/Sales%20info/leanIX_Microservices-Study.pdf