CADEC 2017 - DDD & MICROSERVICES

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ANDREAS TELL

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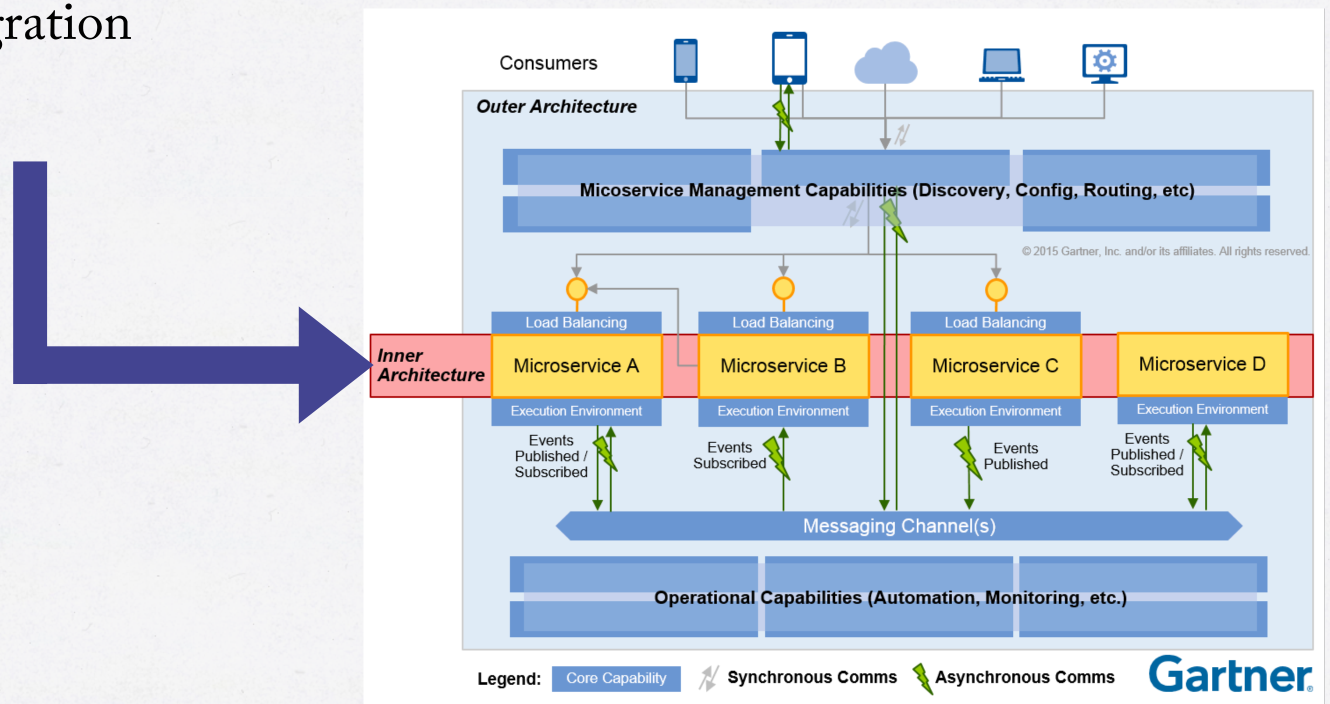
META PRESENTATION

In this talk:

- Brief intro to main concepts
- Rationales
- Useful DDD concepts
- Migration

Out of scope:

- Infrastructure
- DDD In-Depth



http://blogs.gartner.com/gary-olliffe/2015/01/30/microservices-guts-on-the-outside/

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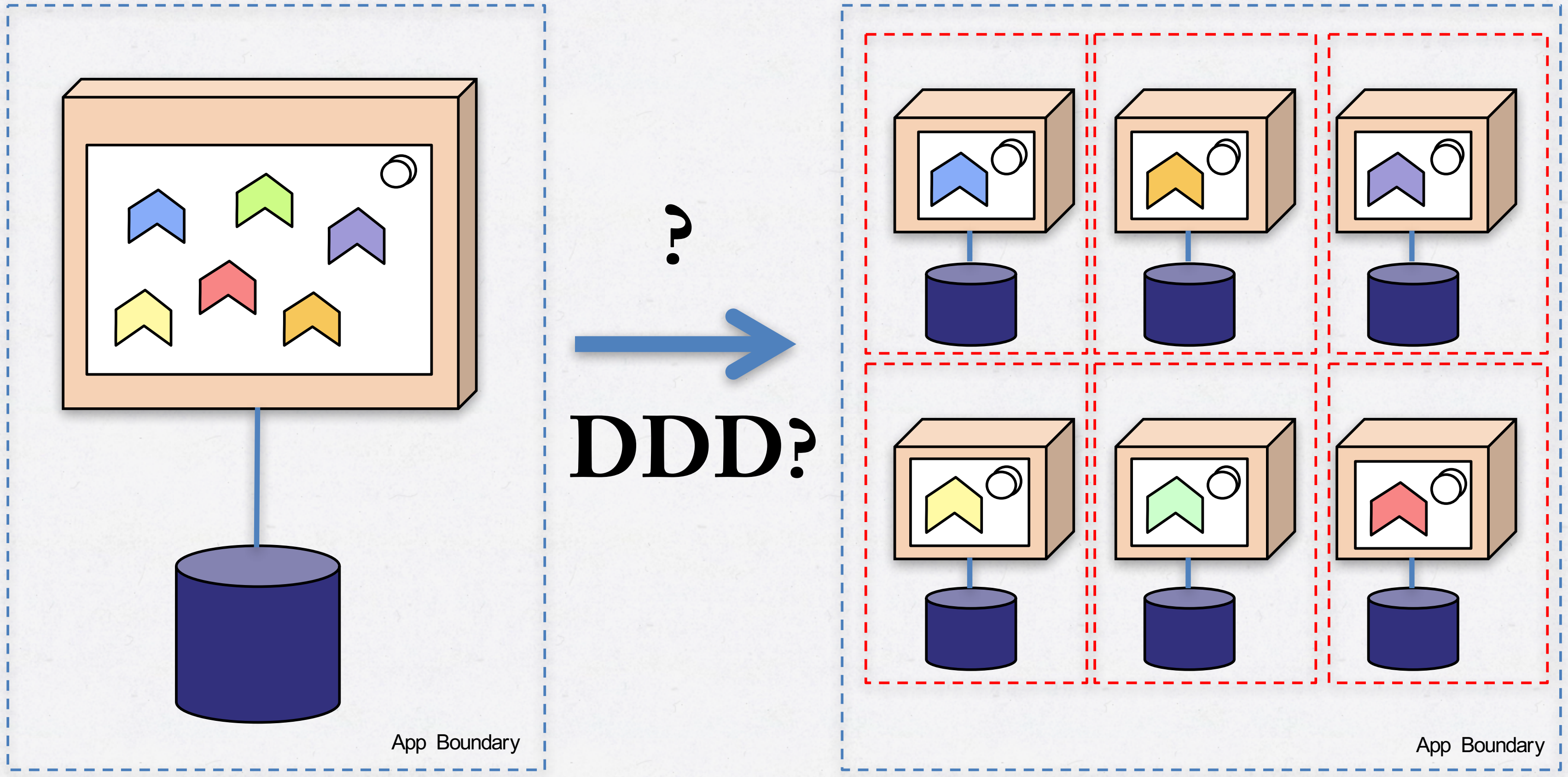
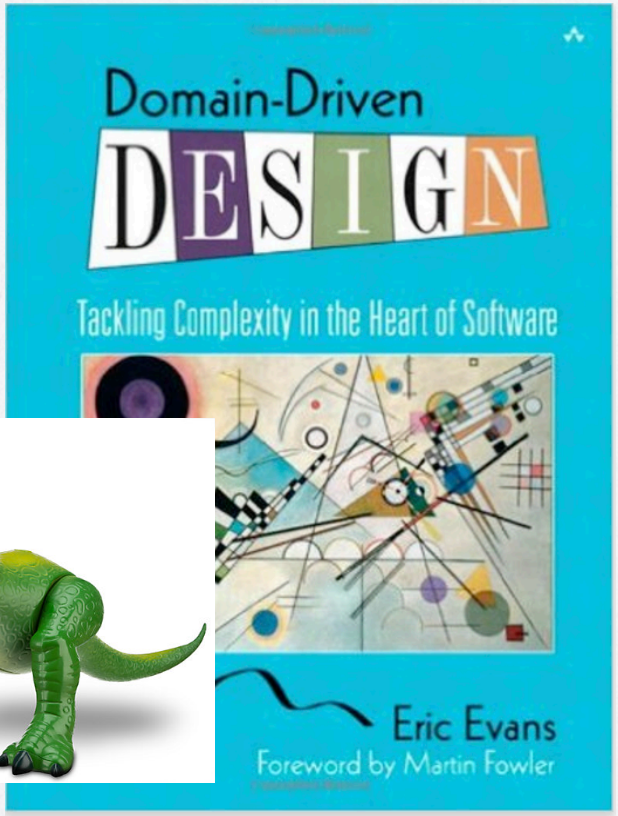
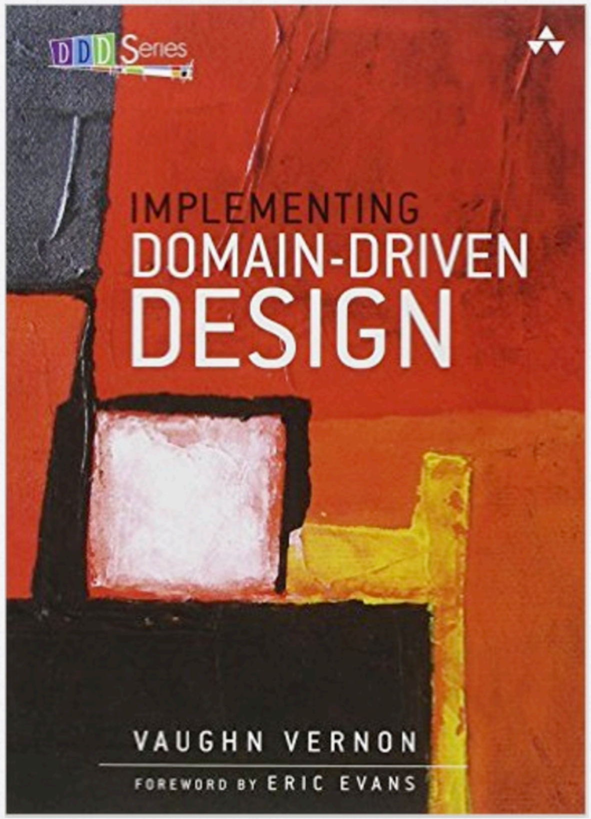


DDD - BLUE OR RED PILL?


Domain-Driven
DESIGN
Tackling Complexity in the Heart of Software
Eric Evans
Foreword by Martin Fowler



(c) Disney

https://www.amazon.com/Domain-Driven-Design-Tackling-Complexity-Software/dp/0321125215
https://www.amazon.com/Implementing-Domain-Driven-Design-Vaughn-Vernon/dp/0321834577

DDD - DEFINITION

Focus on the Domain and the complexity and opportunity within it

*"**Domain-Driven Design (DDD)** is an approach to software development for complex needs by connecting the implementation to an evolving model"*

May not carry it's own weight for trivial problems

Write software that expresses those models, using a defined terminology and concepts within an explicit boundary

Base complex designs on models… produced by an iterative and close collaboration between Domain Experts and Software Experts

https://en.wikipedia.org/wiki/Domain-driven_design

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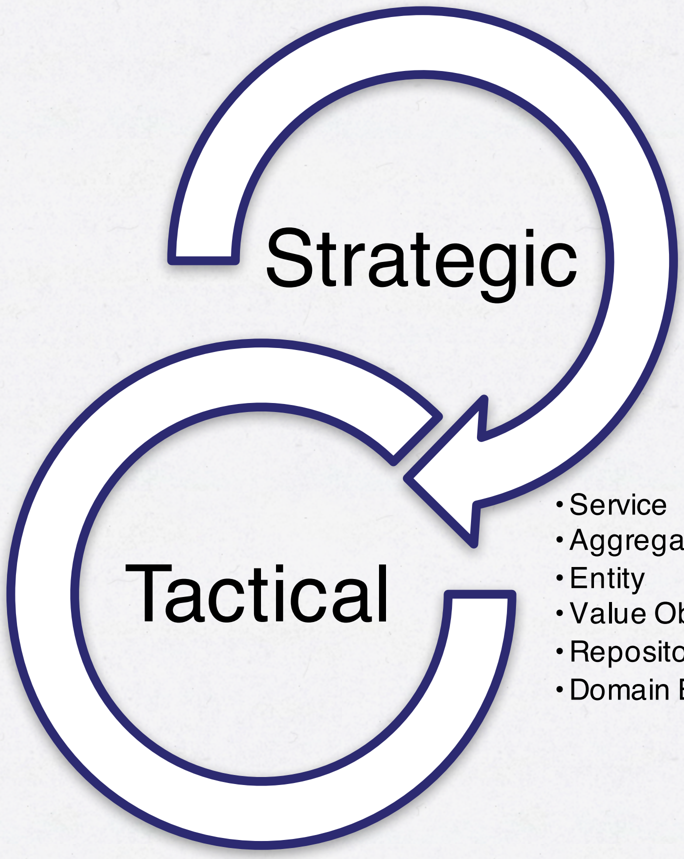
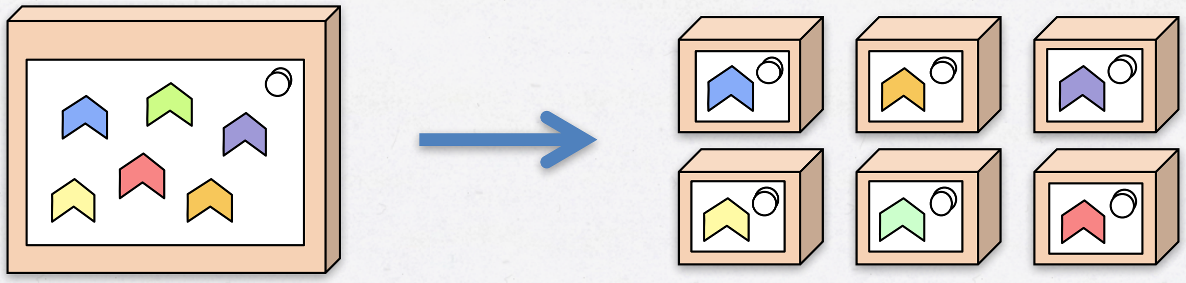
DDD - TWO PARTS



- Bounded Context
- Ubiquitous Language
- Subdomains
- Context Mapping

- Service
- Aggregate
- Entity
- Value Object
- Repository
- Domain Event

MICROSERVICES
Definition



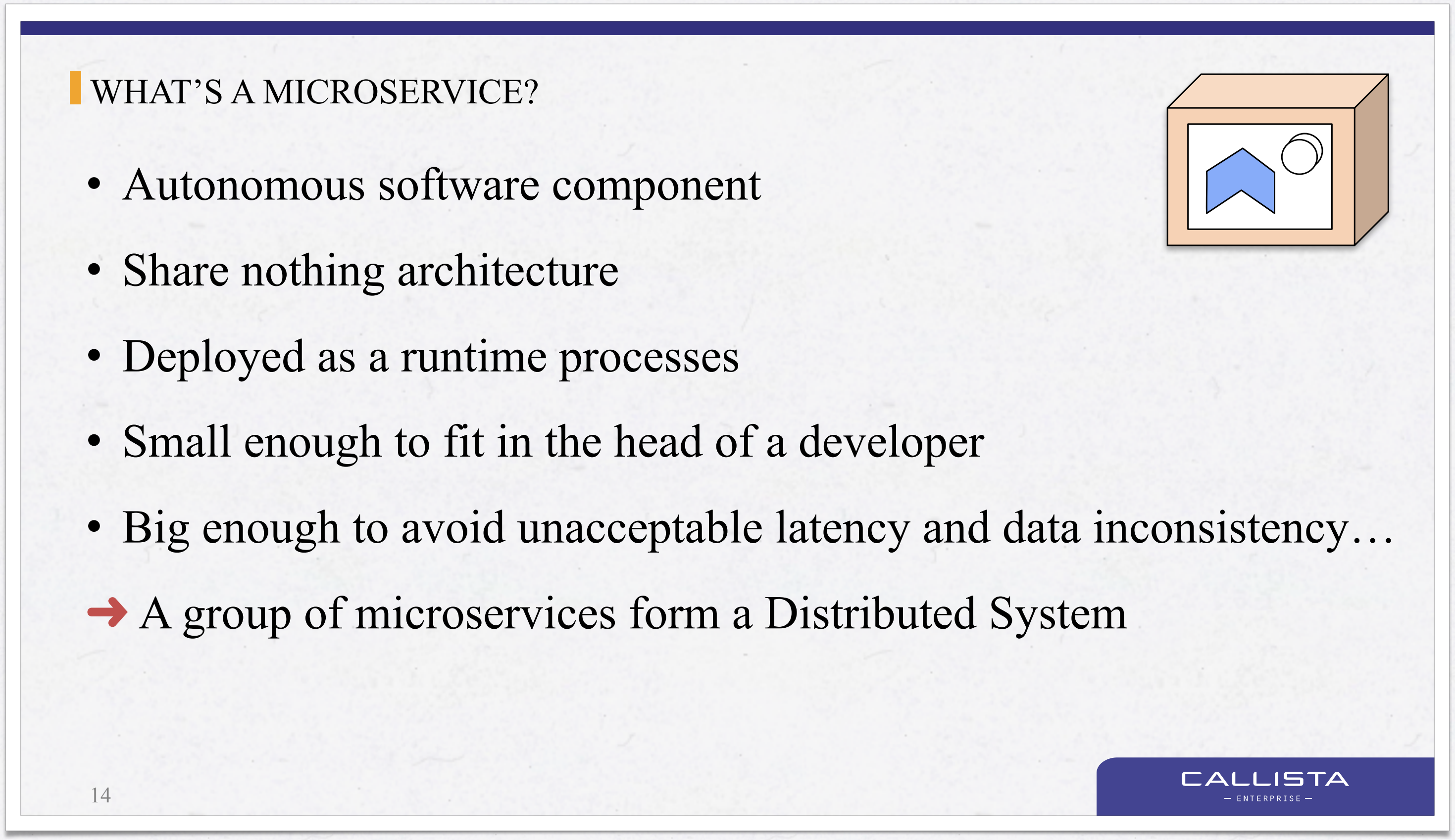
"Small, autonomous services that work together, modelled around a business domain."

Sam Newman, "Building Microservices" O'Reilly Media 2015

MICROSERVICES

Yet a definition

Cadec 2016 – ”Microservices and Docker containers”



WHAT’S A MICROSERVICE?

- Autonomous software component
- Share nothing architecture
- Deployed as a runtime processes
- Small enough to fit in the head of a developer
- Big enough to avoid unacceptable latency and data inconsistency…

➜ A group of microservices form a Distributed System

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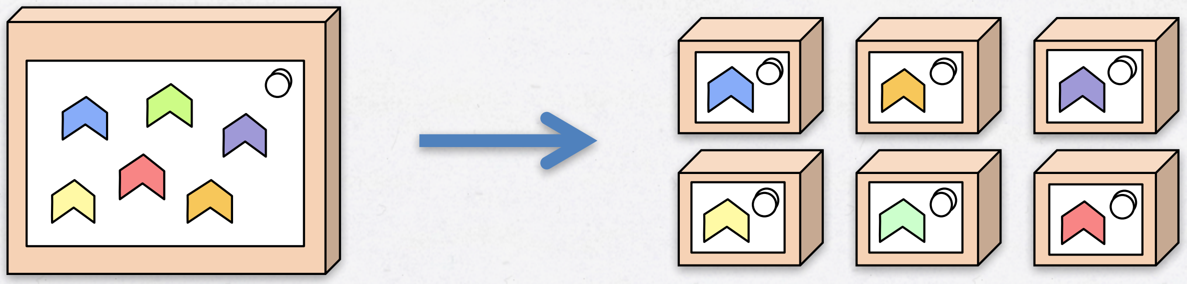
MICROSERVICES

Definition



?

"Small, autonomous services that work together, modelled around a business domain."

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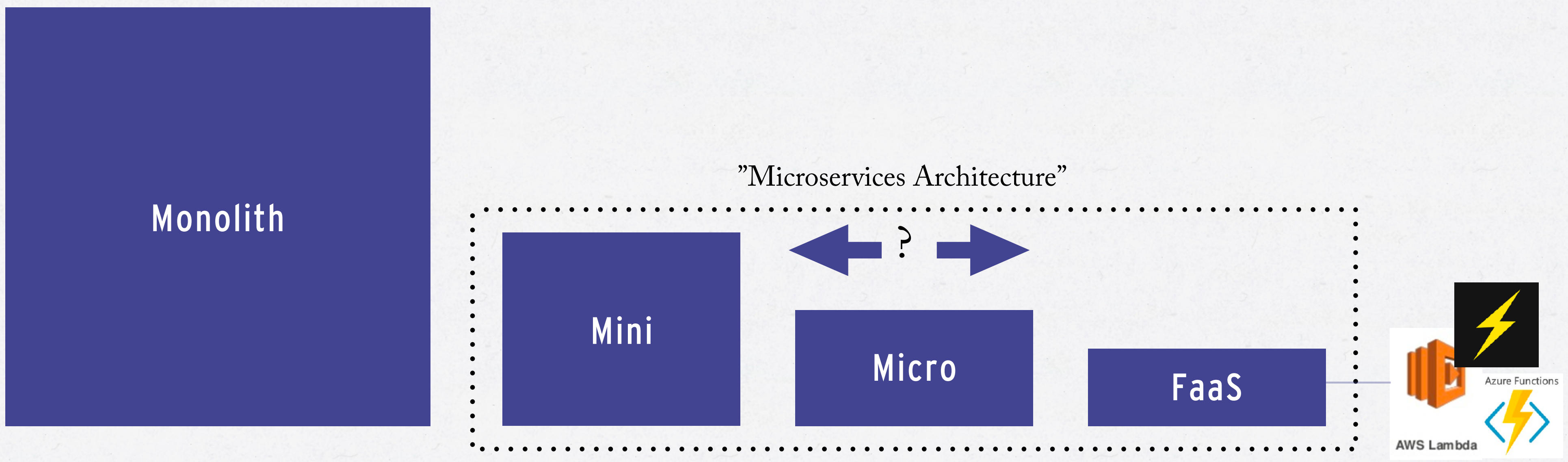
SIZE?



Gartner: By 2017, more than 90% of organizations that try microservices will find the paradigm too disruptive and use miniservices instead.

When starting out with Microservices, aim for coarse grained services.

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RATIONALE FOR MICROSERVICES

Business	• Time to market • Agility
Runtime	• Scalability (Elasticy, Density, Performance) • Resilience • Deployability
Organization	• Autonomous ”DevOps teams” formed around business capabilities
Maintainability	• Polyglot (across the entire stack) • Replaceability & Composability • Small …

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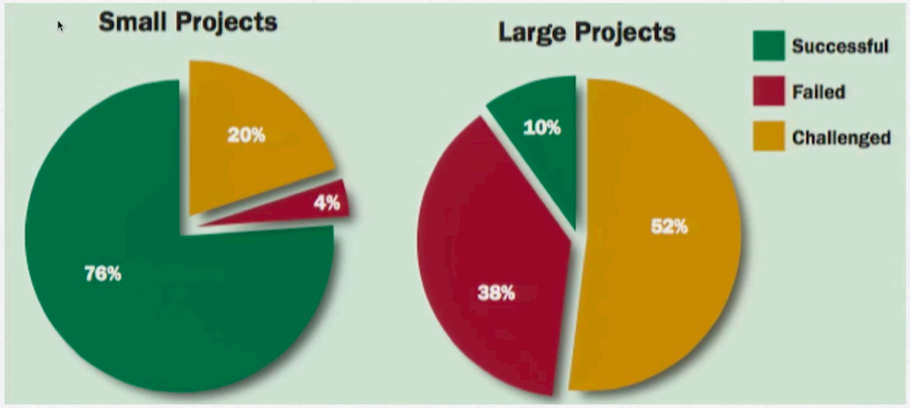
SMALL IS THE NEW BLACK

Benefits of "Small":

- Easier to understand
- Enables small and efficient teams
- Likelihood of successful project higher (on time and budget)



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

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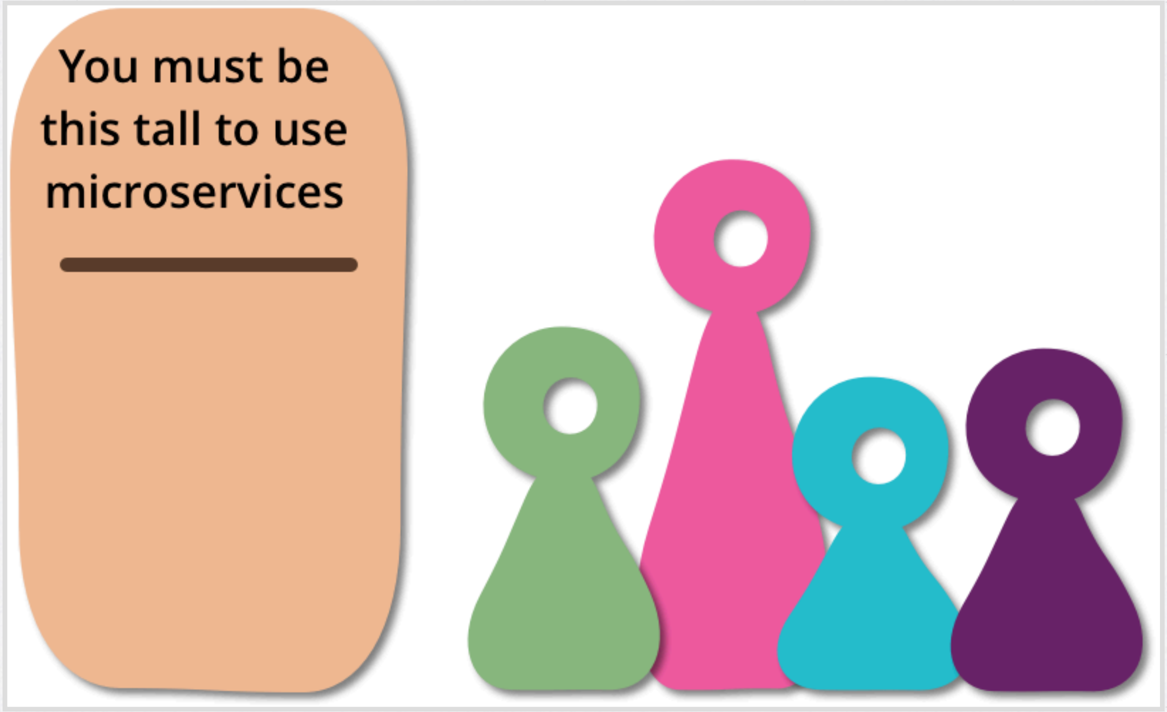
… NO SUCH THING AS A FREE LUNCH

- Rapid Provisioning
- Basic Monitoring
- Rapid Application Deployment

Distributed Systems:"
Stateless"
Immutable infrastructure"
Service Discovery, API Gateway,
Circuit Breakers, Centralized
Configuration, Monitoring/Logging"
Latency"
New integration patterns"
Eventual Consistency"
Continuous Delivery"
DevOps - NoOps"
New Governence Standards"
New Release Process



https://martinfowler.com/bliki/MicroservicePrerequisites.html

RATIONALE FOR DDD AND MICROSERVICES?

Challenges in the "traditional enterprise"

- Complex business process (and organization)
- A (large) gap between IT and business
- Long lifecycle of software systems
- (Legacy)

https://www.flickr.com

DDD AND MICROSERVICES? HOW DO THEY CONVERGE?

Microservices

- Scalability
- Agility

BOUNDARIES
MODULARITY
COUPLING
COHERENCE
SRP (Single Responsibility Principle)

DDD

- Complexity

DDD paired with Microservices can amplify the quality attributes of the software solution.

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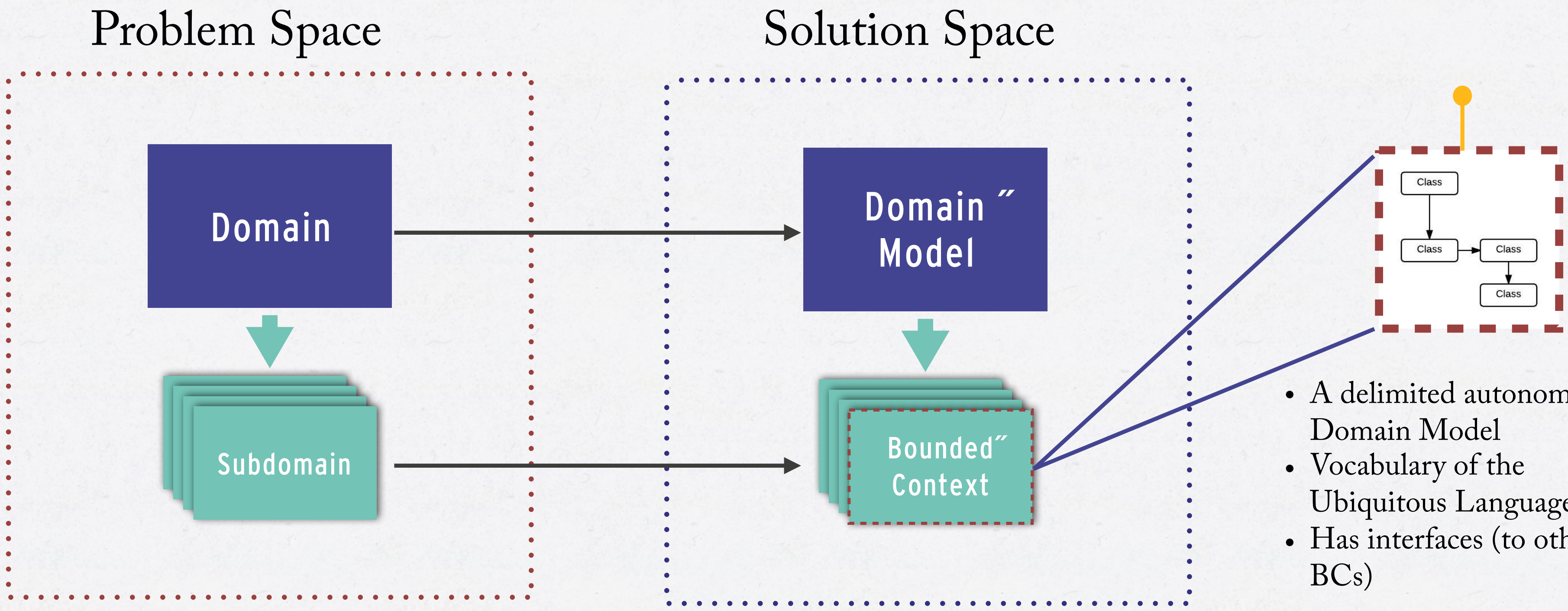
BOUNDED CONTEXT

"… a boundary (typically a subsystem, or the work of a particular team) within which a particular model is defined and applicable.



- A delimited autonomous, Domain Model
- Vocabulary of the Ubiquitous Language
- Has interfaces (to other BCs)

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BOUNDED CONTEXT

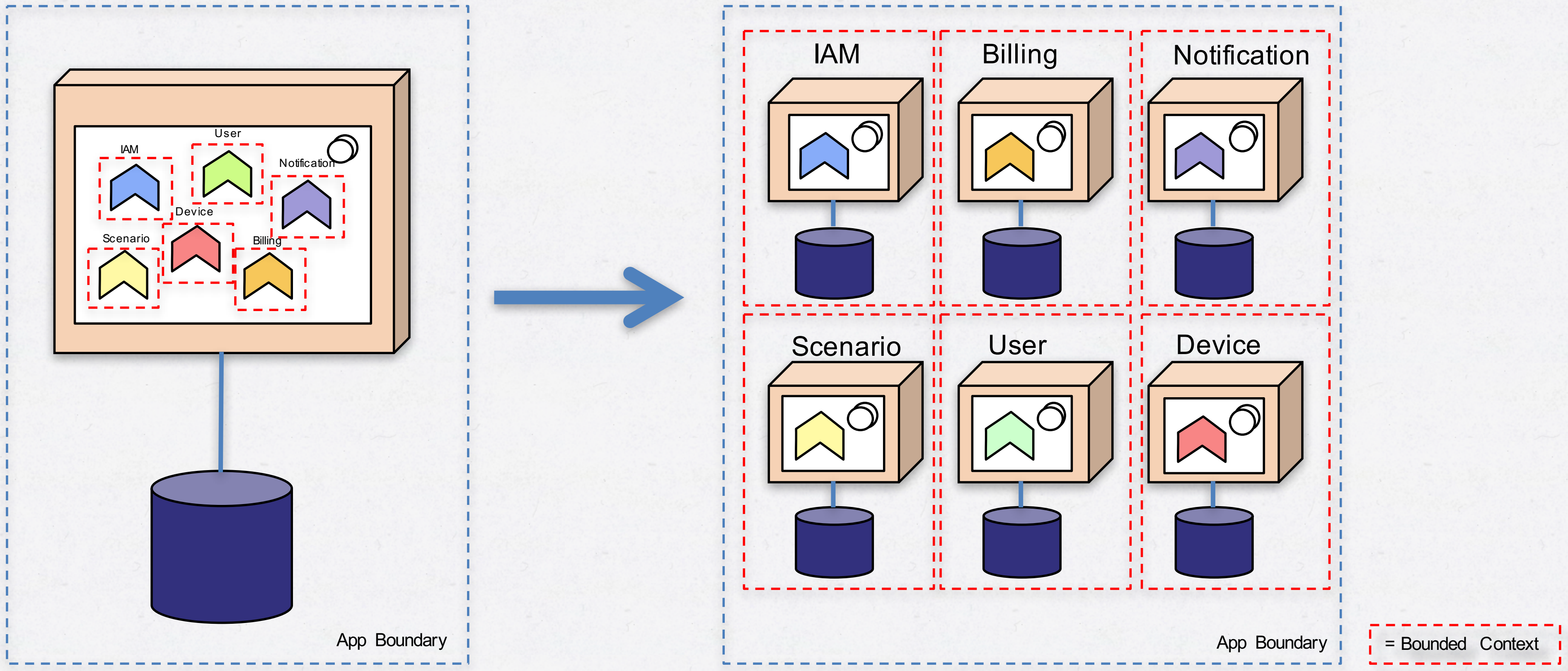
"… a boundary (typically a subsystem, or the work of a particular team) within which a particular model is defined and applicable.

- How do we find them?
- Bounded Context in software:
  - Logical separation-> Weak: Namespaces (JVM: Packages)
  - Binary separation-> Medium: Binary artifacts (JVM: JAR)
  - Process separation -> Strong: Deployment Unit separation

Model your Microservices around business domains, i.e. align Bounded Context with Service Boundary.

BOUNDED CONTEXT

Applied to a fictive domain



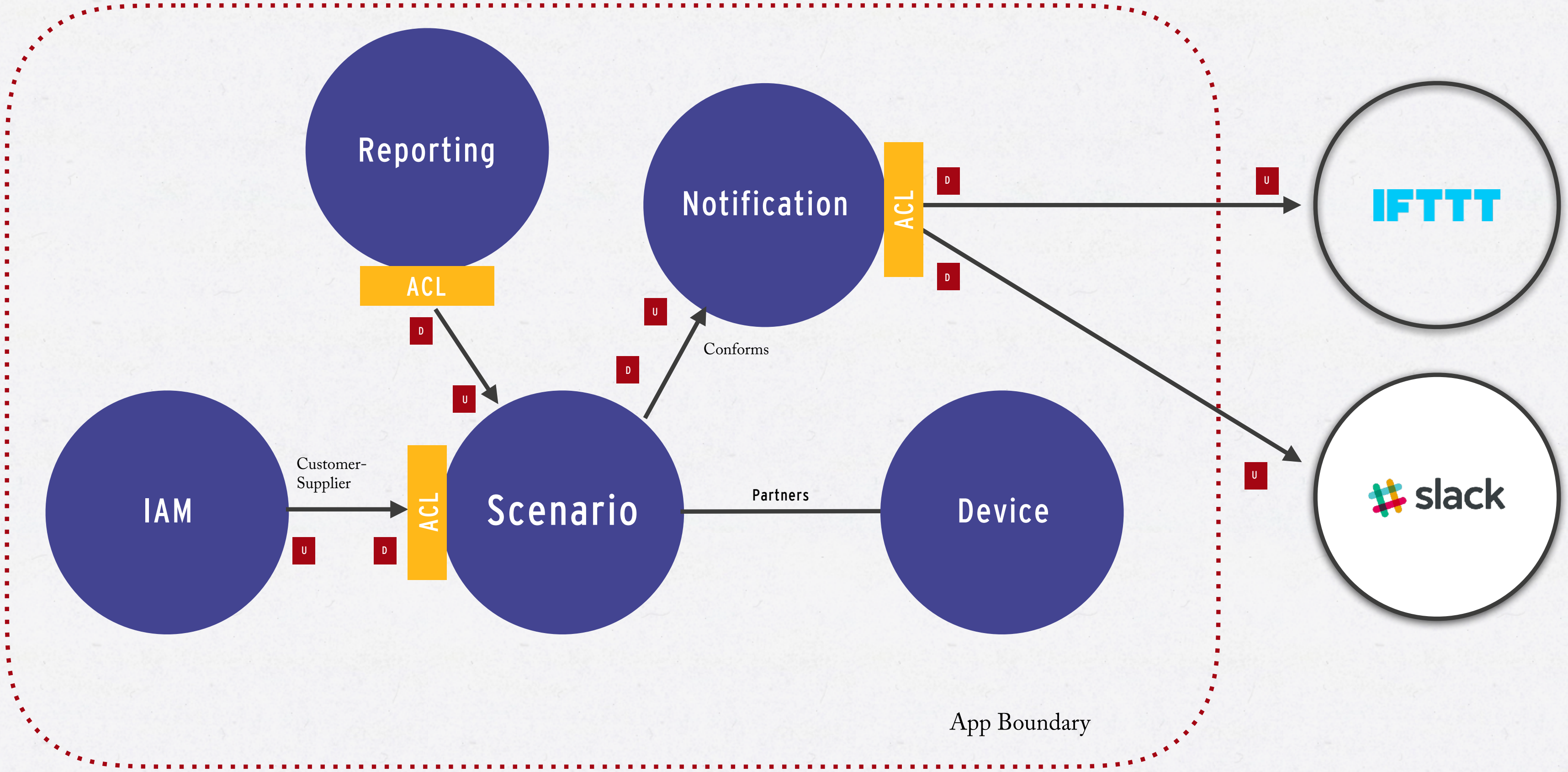
CONTEXT MAP

"Identify each model in play on the project and define its Bounded Context"

- A simple diagram that captures the ”existing terrain”
- A catalyst for inter-team communication
- Find relationships with all other projects you depend on
- ”A Context Map is not an Enterprise Architecture or system topology diagram”

CONTEXT MAP

Example

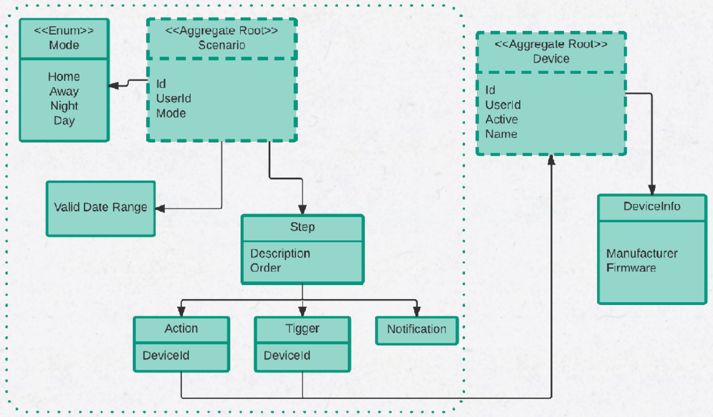


Use Context Maps to get an understanding of how BC's and services depend on each other.

AGGREGATE

"A cluster of associated objects that are treated as a unit for the purpose of data changes"

- Arrange related objects under a common "parent" designated as the *Aggregate Root*
- Reference other Aggregates (Root) by Identity
- A set of consistency rules applies within the aggregate
- Should be kept small (performance, scalability)
- Referenced Aggregates are eventually consistent



Group Domain Objects as Aggregates (may be several in one BC) to identify the "minimum size" of a Microservice.

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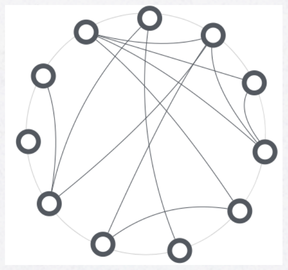
DOMAIN EVENTS

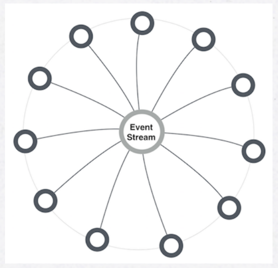
"Something happened that Domain Experts care about"

- Part of the Domain Model expressed in the *Ubiquitous Language*
- Identify Domain Events early to understand cross-service communication needs and find service boundaries
- Event Sourcing and CQRS (Command Query Responsibility Segregation) are common associated patterns…

Point-To-Point Orchestration



EDA Choreography

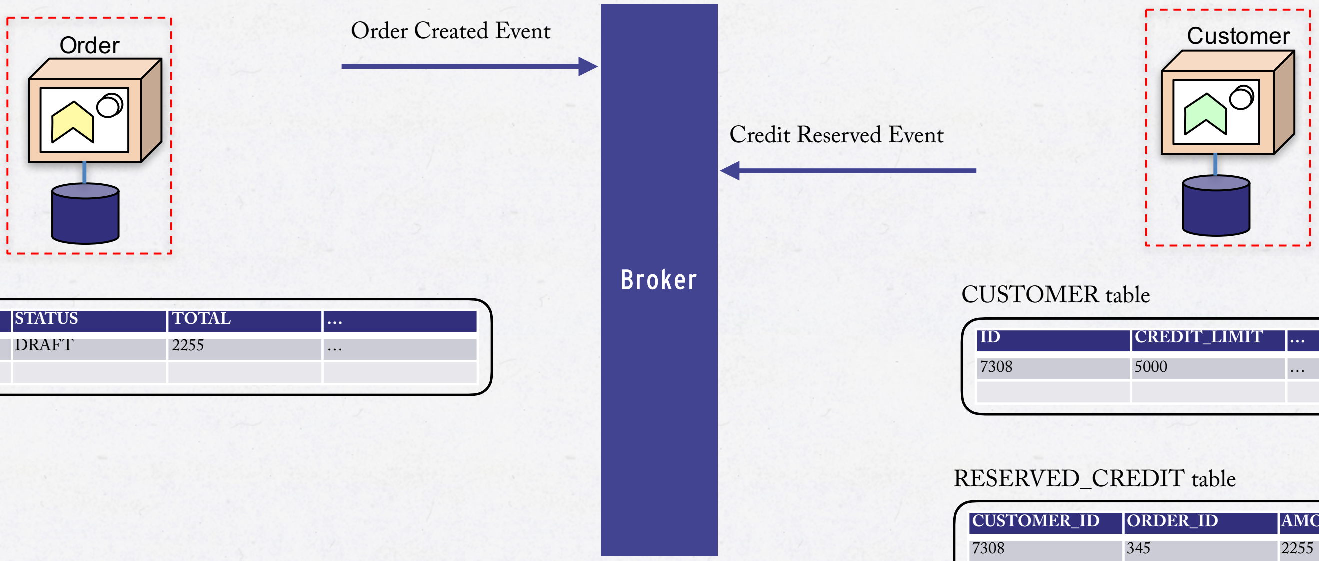


https://www.thoughtworks.com/insights/blog/scaling-microservices-event-stream

DOMAIN EVENTS

Eventual Consistency

"Something happened that domain experts care about"



ORDER table

ID	CUSTOMER_ID	STATUS	TOTAL	...
345	7308	DRAFT	2255	...

CUSTOMER table

ID	CREDIT_LIMIT	...
7308	5000	...

RESERVED_CREDIT table

CUSTOMER_ID	ORDER_ID	AMOUNT
7308	345	2255

Model Domain Events to facilitate eventual consistency across Aggregates and Bounded Contexts - i.e. across services in a Microservice context.

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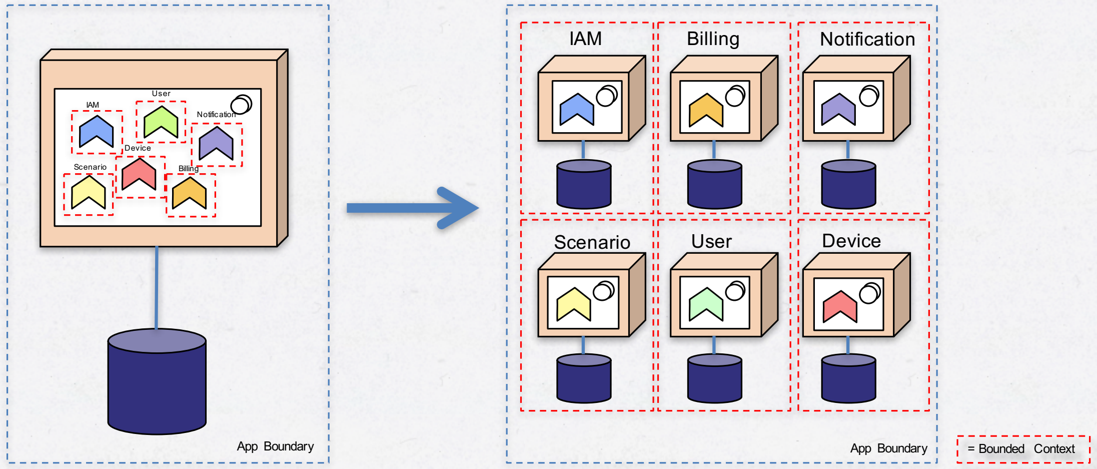
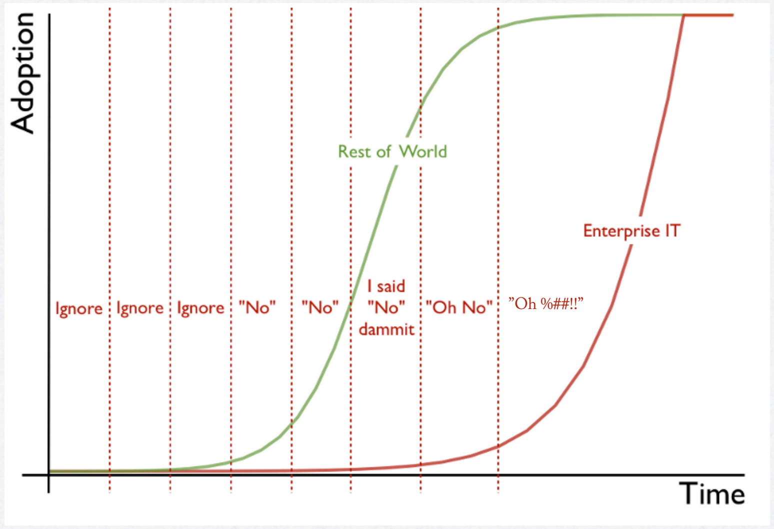


MIGRATION

Strategies

- Big Bang : dump and start over from scratch
- Strangler application
  - http://paulhammant.com/2013/07/14/legacy-application-strangulation-case-studies/
- Monolith first…
  - https://martinfowler.com/bliki/MonolithFirst.html
- … or not
  - http://martinfowler.com/articles/dont-start-monolith.html



http://enterpriseitadoption.com/

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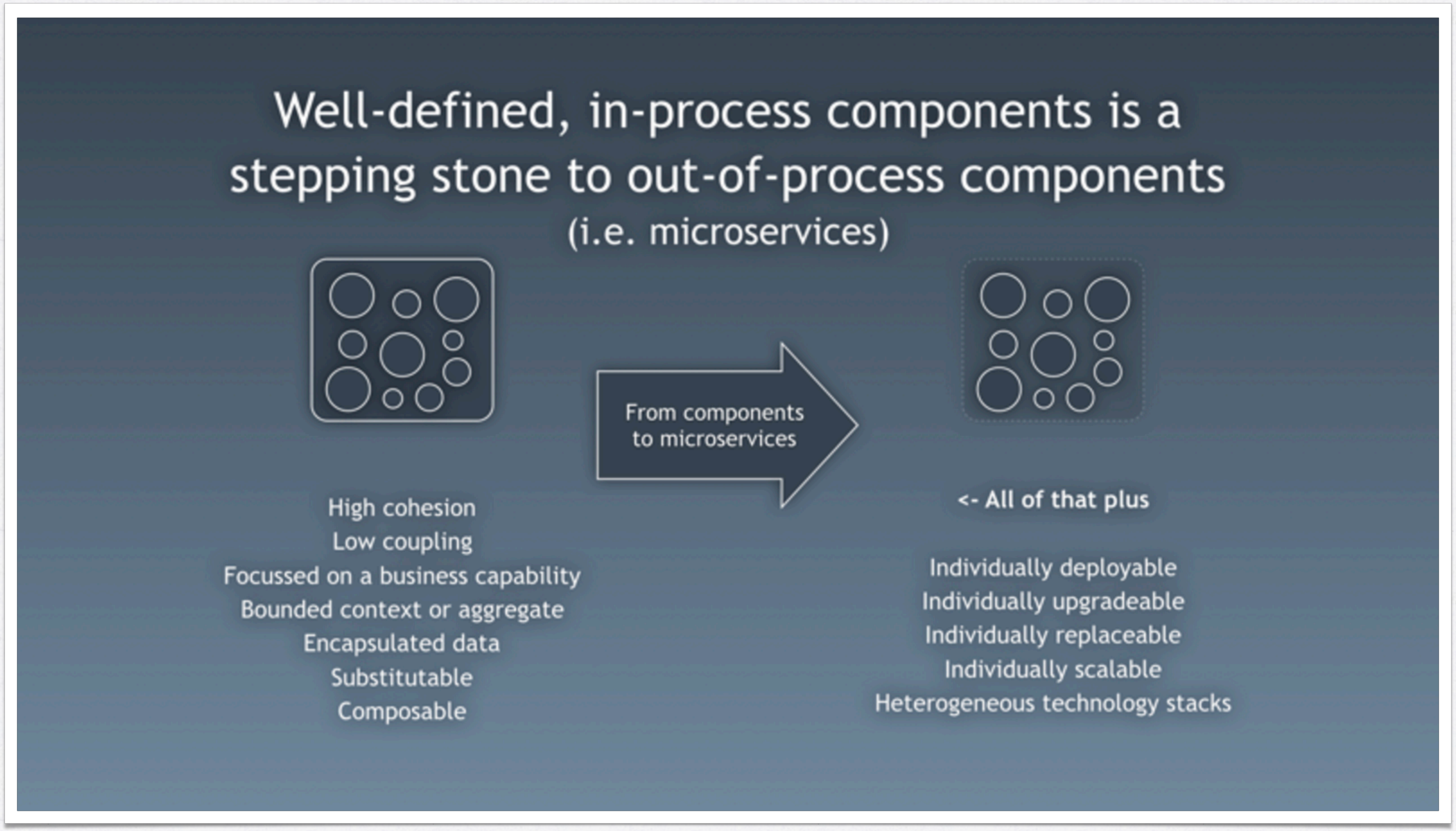
THE STRUCTURED MONOLITH



Well-defined, in-process components is a stepping stone to out-of-process components (i.e. microservices)

From components to microservices

High cohesion
Low coupling
Focussed on a business capability
Bounded context or aggregate
Encapsulated data
Substitutable
Composable

<- All of that plus

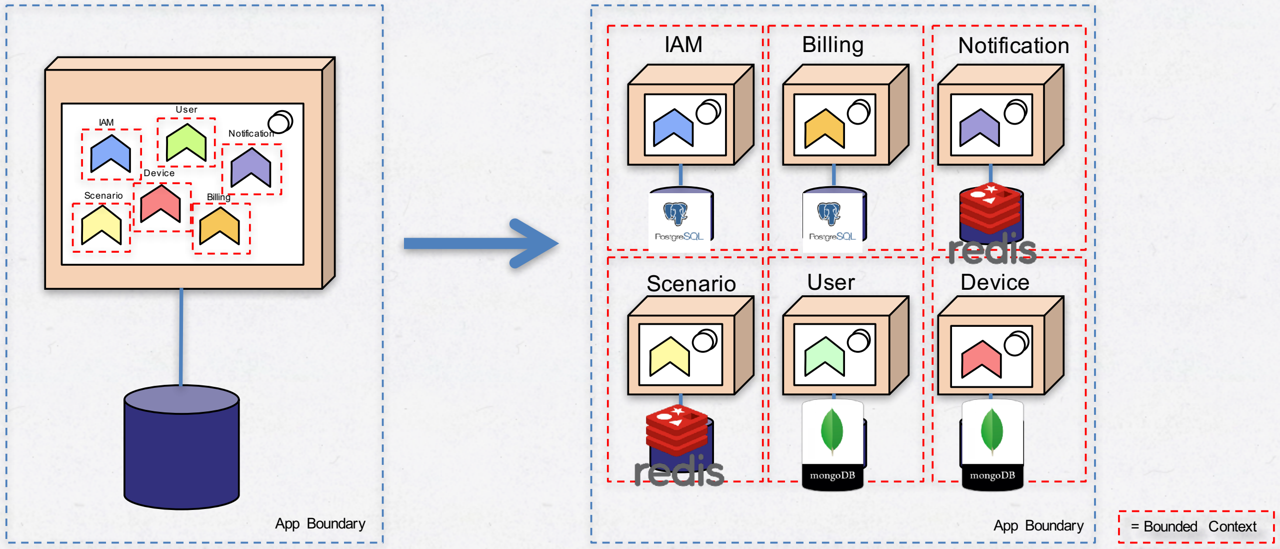
Individually deployable
Individually upgradeable
Individually replaceable
Individually scalable
Heterogeneous technology stacks

Simon Brown http://www.codingthearchitecture.com/presentations/devnexus2016-modular-monoliths

DATA MIGRATION

One DB (schema) to rule them all?

- Independently scalable?
- Low impact schema changes?
- Technology opportunities?



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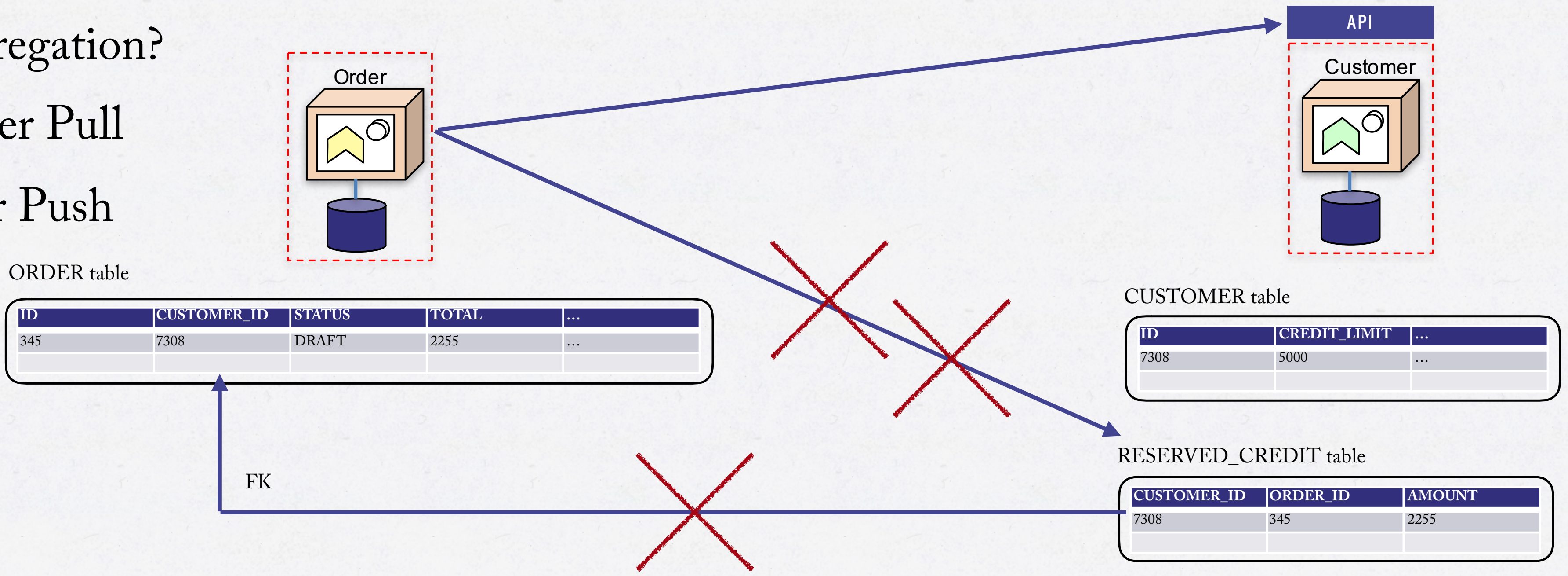
DATA MIGRATION

Consequences and considerations

- ACID to Eventual Consistency
- Orphaned data?
- Data Aggregation?
  - Consumer Pull
  - Producer Push



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TO SUM UP

Microservices

- Most applications will benefit from a Microservices arch:˝
  - Application Longevity - cost and complexity under long term control!˝
  - Not just of about Scalability!˝
- BUT: Does your organization have the capabilities (culture, skills, infra)?

DDD

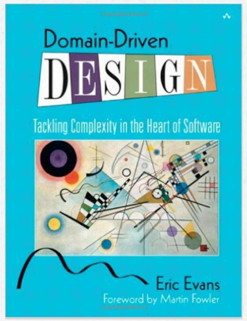
- DDD is en excellent allied when crafting distributed applications - highly coherent, loosely coupled ar in tune with business˝
- Helps us find the Service Boundaries and gives internal structure˝
- Results in a domain model based on crips concepts, with little room for misconceptions.

Migration

- Stay with a well structured Monolith until you get boundaries right˝
- Partial replacement (Strangler pattern) to play it safe˝
- Start small (i.e. big) and learn as you go…

WHERE TO GO FROM HERE

References and Acknowledgments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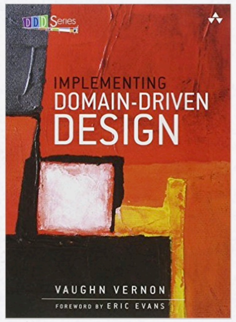
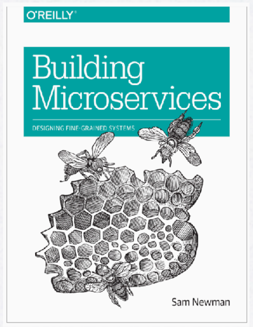
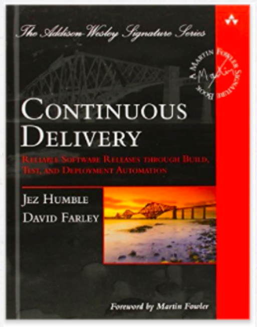


https://www.amazon.com/Implementing-Domain-Driven-Design-Vaughn-Vernon/dp/0321834577



https://www.amazon.com/Building-Microservices-Designing-Fine-Grained-Systems/dp/1491950358/


The Addison-Wesley Signature Series
CONTINUOUS DELIVERY
RELIABLE SOFTWARE RELEASES THROUGH BUILD, TEST, AND DEPLOYMENT AUTOMATION
JEZ HUMBLE
DAVID FARLEY
Foreword by Martin Fowler

https://www.amazon.com/Continuous-Delivery-Deployment-Automation-Addison-Wesley/dp/0321601912/

https://www.amazon.com/Release-Production-Ready-Software-Pragmatic-Programmers/dp/0978739213

Eric Evans - Jan 2016 - ”Tackling Complexity In the Heart of Software”: https://www.youtube.com/watch?v=dnUFEg68ESM

Greg Young, CQRS & Event Sourcing
https://www.infoq.com/news/2016/04/event-sourcing-anti-pattern

http://codebetter.com/gregyoung/2010/02/16/cqrs-task-based-uis-event-sourcing-agh/

Chris Richardson, Developing Transactional Microservices

https://www.infoq.com/articles/microservices-aggregates-events-cqrs-part-1-richardson