# **Find Your Inner Bounded Context**

A case study of breaking up a large monolithic application

### **Jim Everett**

**Developer, Architect, Software Enthusiast** 



### **Experience**

**HMBer** 

Married father of 2

**Software Enthusiast** 

15 years of .NET Experience

**Enterprise Architect** 

Developer

Scrum Master

Life Learner







### **Outline**

What are we doing today?

1

Bounded Context
Definition of bounded context and why it is important

### **Problem**

What problem are we trying to solve?

3

A Developer's Journey
Case study

### **Takeaways**

Review of practical ideas to be learned from case study

2

4



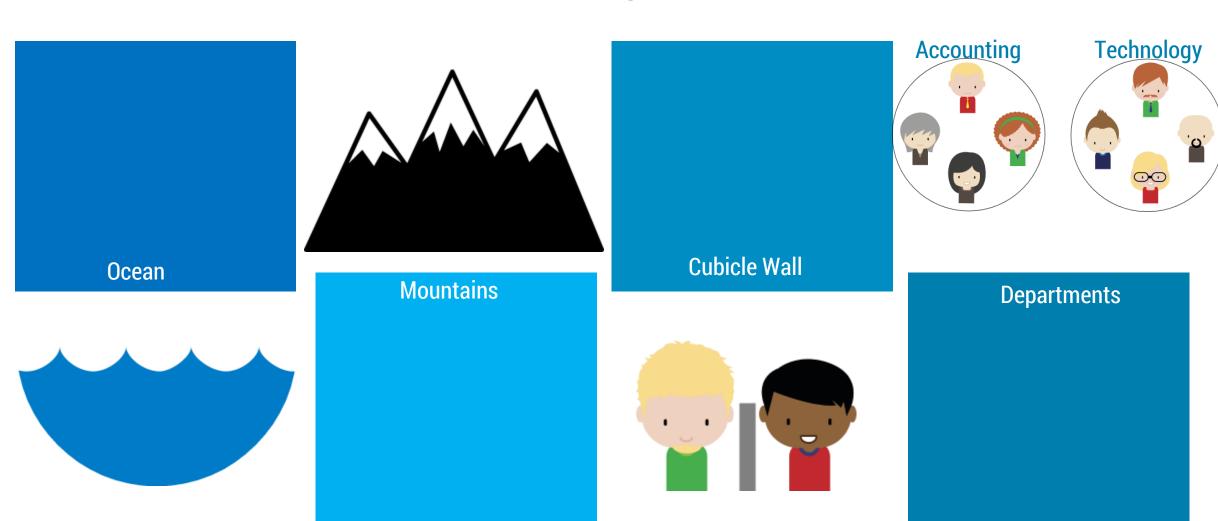
# **Boundary**

**Definiton** 

A real or imagined point or limit that indicates where two things become different.

# **Boundary Examples**

**Real or Imagined** 



### **Context**

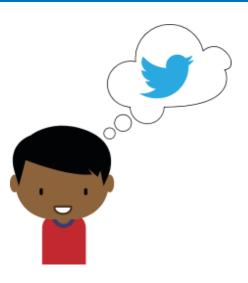
**Definition** 

Background, environment, framework, setting, or situation surrounding an event or occurrence, which helps explain its full meaning.

# **Context Example**

### Tim concentrated and contorted his face while he created a tweet.

**Twitter** 



**Context** 

We were all amazed at how insightful and concise his tweet was.

Musical

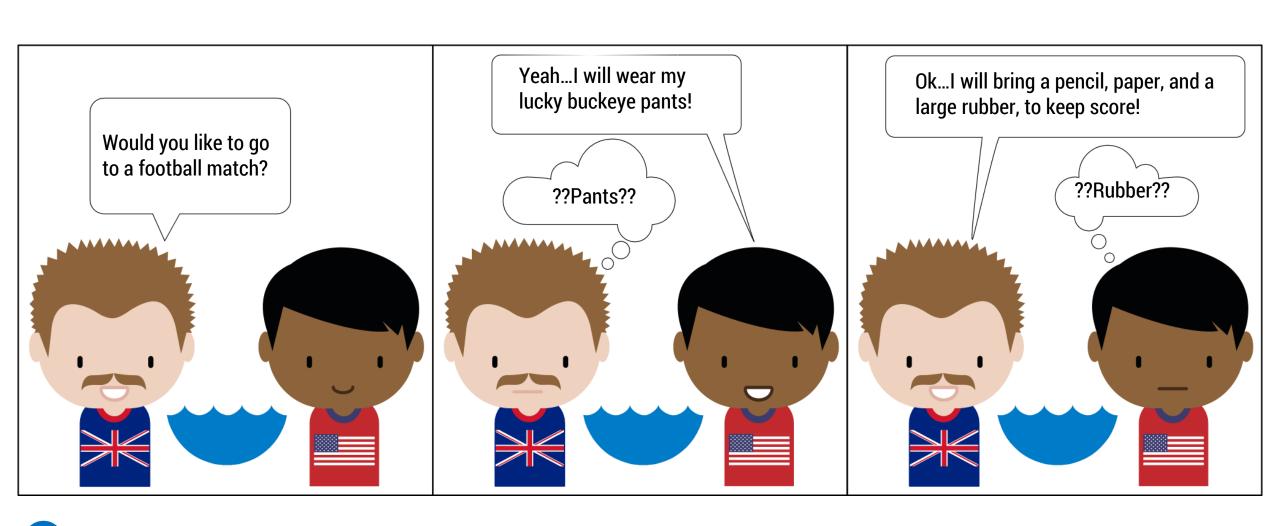


Context

We were all amazed by the sound coming from his face.

# **A Boundary Without Context**

**United Kingdom & United States** 



# **Domain-Driven Design Bounded Context**

**Definition** 

"DDD deals with large models by dividing them into different Bounded Contexts and being explicit about their interrelationships." — Martin Fowler



# **DDD Boundary**

- Explicit
- Keeps the knowledge inside consistent whilst ignoring the noise from the outside world
- Formalize interactions between different contexts

### **DDD Context**

**Definition** 

The setting in which a word or a statement appears that determines its meaning.

# **DDD Unbounded Context Example**

**Personal Finance Application** 

Account - Credentials

Account - Money

Login
Username
Password
Sign in

# **Apply Context To Software**

Models

The maximum extent a model can be stretched without compromising its conceptual integrity is called a *context*.

# **Ubiquitous Language**

**DDD – Common, Rigorous, Shared Language** 

Special condition where every term has a single unambiguous definition.

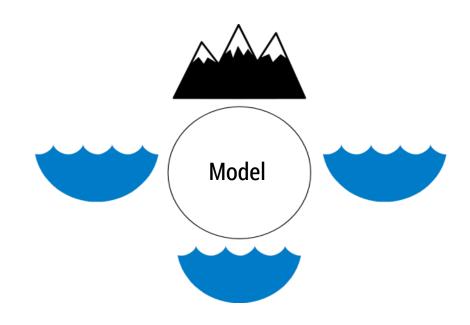
# **Ambiguity**

Super Villain of Ubiquitous Language!



### **DDD Bounded Context**

Bounded Contexts are models with explicit boundaries, where the model is unambiguous within the boundary.



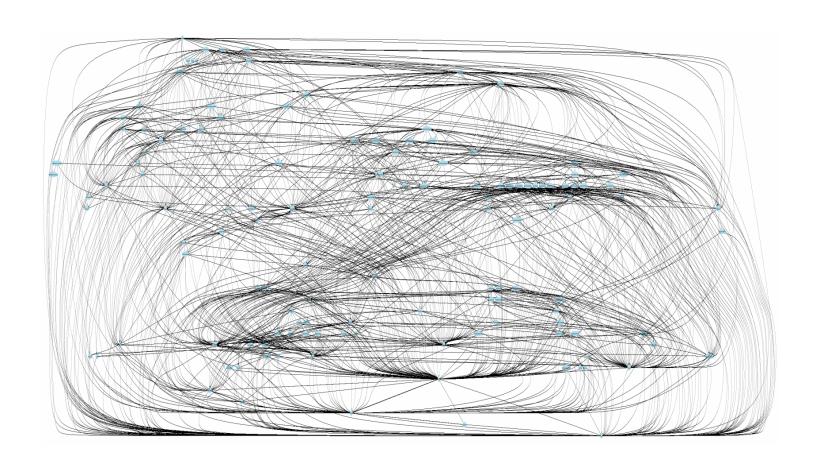
# **Bounded Context == Language**

Defining Bounded Contexts is an exploration of language



# Is this yours?

**Coupled Dependency Graph** 



### So What?

- Difficult to change
- Difficult to test
- Difficult to reason about

# How did we get here?

- Small changes over time
  - Most systems have a stage when they are small
  - As they grow, they become more complex and difficult to understand

# **Cognitive Burden**

- Developers are the limiting factor
- Humans are the limiting factor
- Tools
  - Functions
  - Classes
  - Abstractions
  - Interfaces
  - SOLID
  - Domain-Driven Design
  - Service-Oriented Architecture

# **Essential Complexity is the Model**

- Accidental vs Essential Complexity
- Essential Complexity is in the business domain itself
- Often our issues are not technical hurdles
- Domain a sphere of knowledge, influence, or activity

# **Importance**

- Bounded Context helps to solve Essential Complexity
- Smaller, more focused model allows for better architecture
- Over time we recognized that "total unification of the domain model for a large system will not be feasible or cost-effective" (Eric Evans)

# **Application**

- Decomposition of problem
- Service-Oriented Architecture (SOA)
  - What use cases should be grouped together? Bounded Context.
  - A service should not cross a bounded context.
- Micro Services
  - How to define what is included in a micro service? Bounded Context.
- Command Query Responsibility Segregation (CQRS)
  - What entities should share code? Bounded Context.
- RestFul Services
  - Which resources should be grouped together? Bounded Context.
- Data Access
  - How do I create a data access layer without a one to one relationship with the database? Bounded Context.

### **Cost of Bounded Contexts**

- Identifying Bounded Contexts requires significant effort, so focus on your core business
- Many large business applications would derive value from utilizing Bounded Contexts

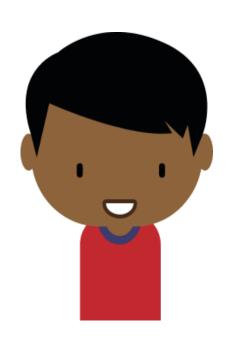


# A LONG TIME AGO IN A FAR AWAY PLACE.

# Colorado

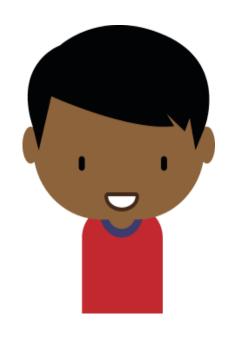


# **Developer**





# **Tim is Reasonably Bright**



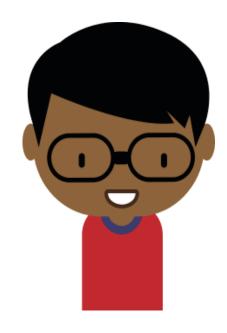


# Marijuana is Not Legal

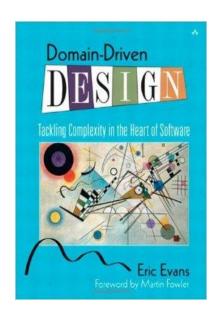




# 2009

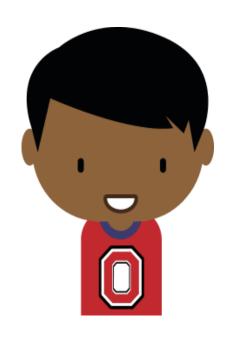


**Yes Tim can Read**But only read Chapters 1 - 11

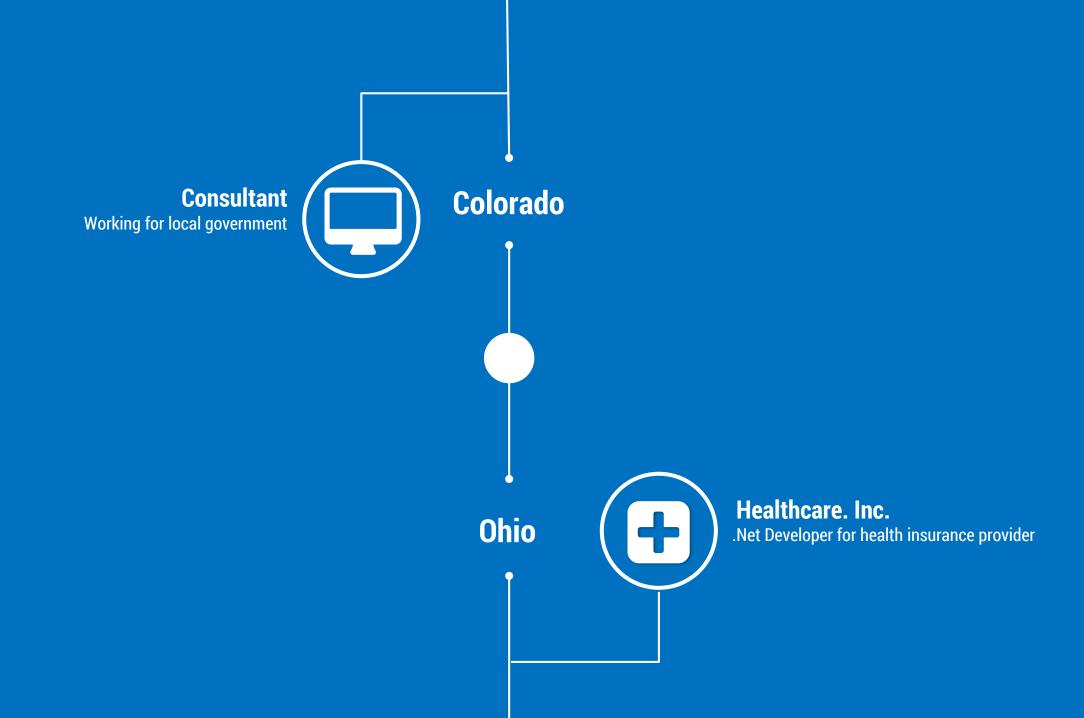


**Domain Driven Design** 

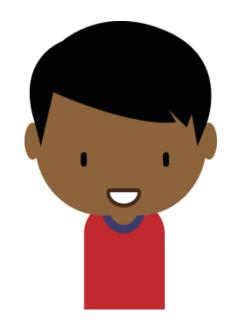
# **New Opportunity**

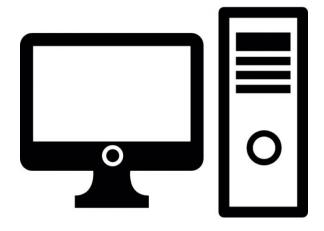




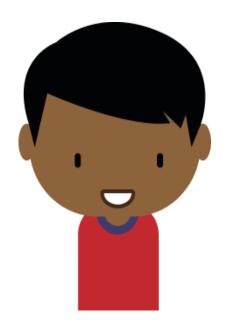


# **Tool On Boarding**



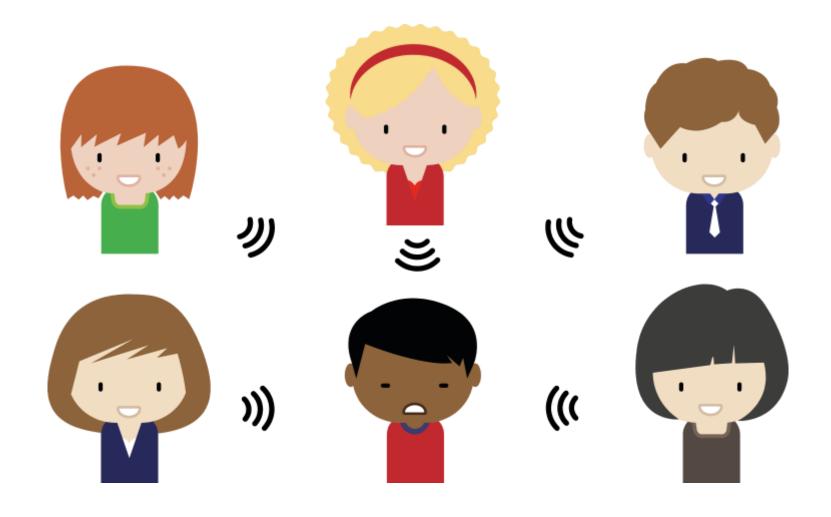


# **Technical On Boarding**

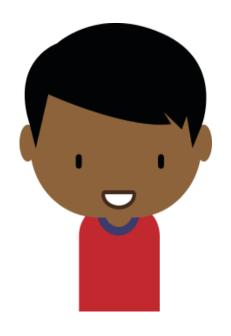


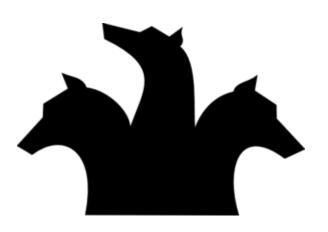


# **Application On Boarding**



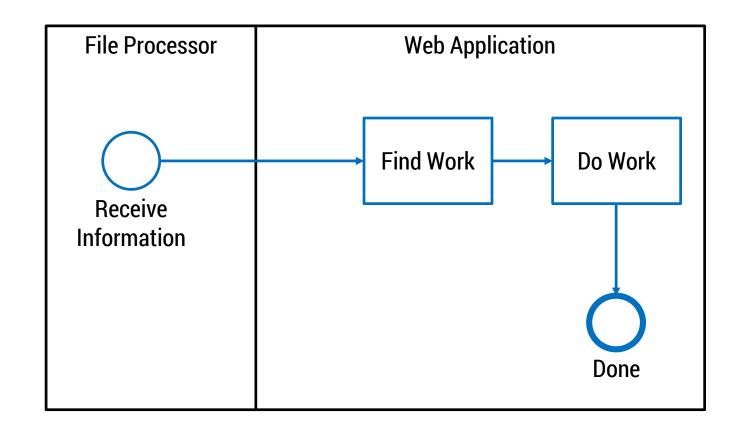
## **Cerberus**





## **Tim's Mental Model 1**

Cerberus

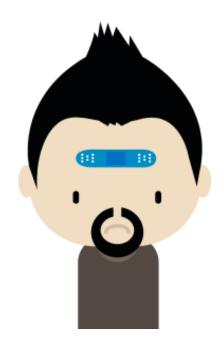


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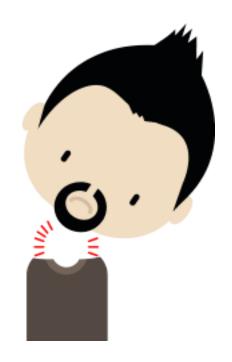


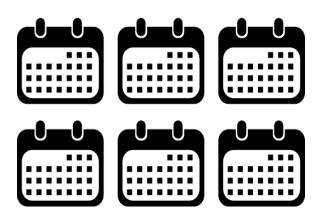
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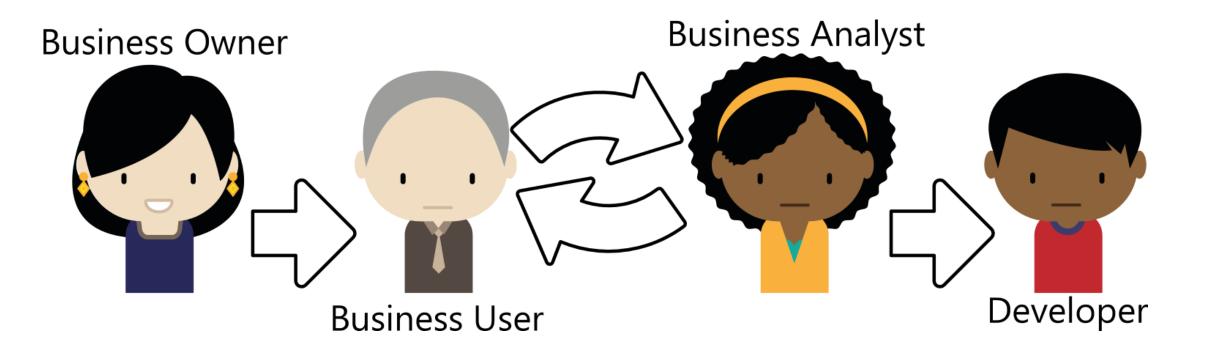


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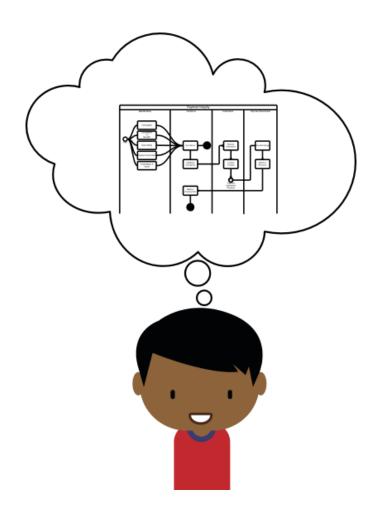




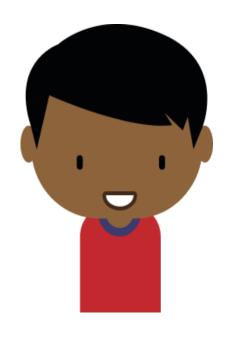
### **Communication Pattern**



## **Mental Model Is Context**



# **New Project**





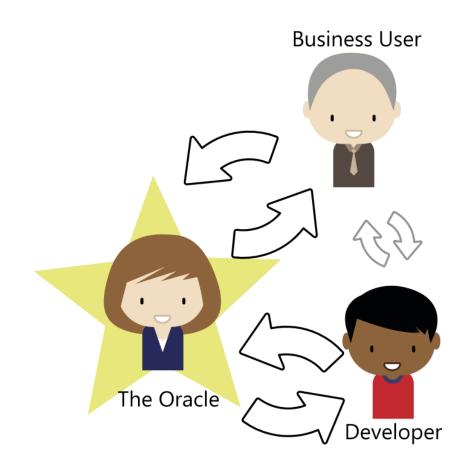
#### The Oracle



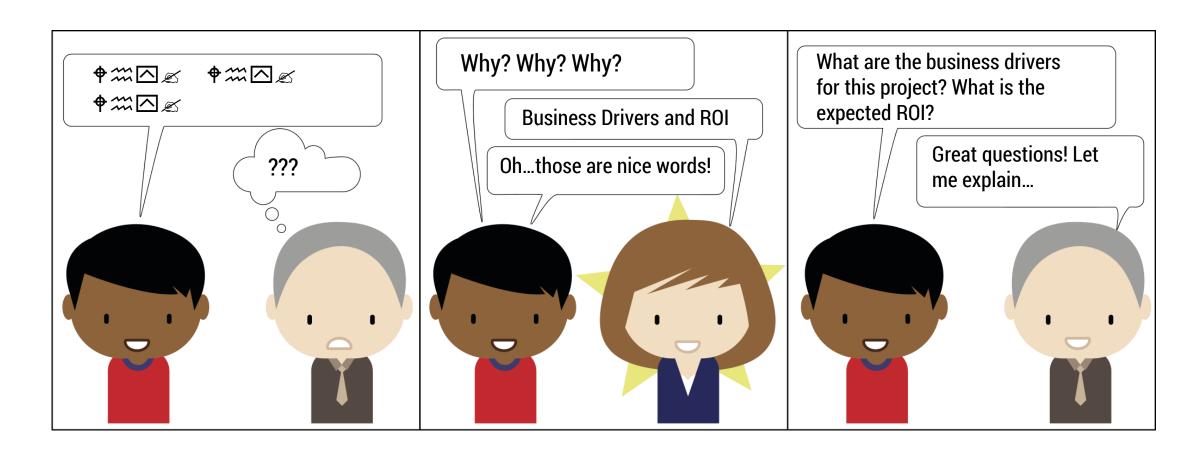
#### **Attributes**

- Access to Business Users
- Understanding of Business Process
- Rough understanding of technology
- Wants to discuss how business works and how technology is being applied to solve problems

# **Oracle, Developer, Business**



## Learning a new Language

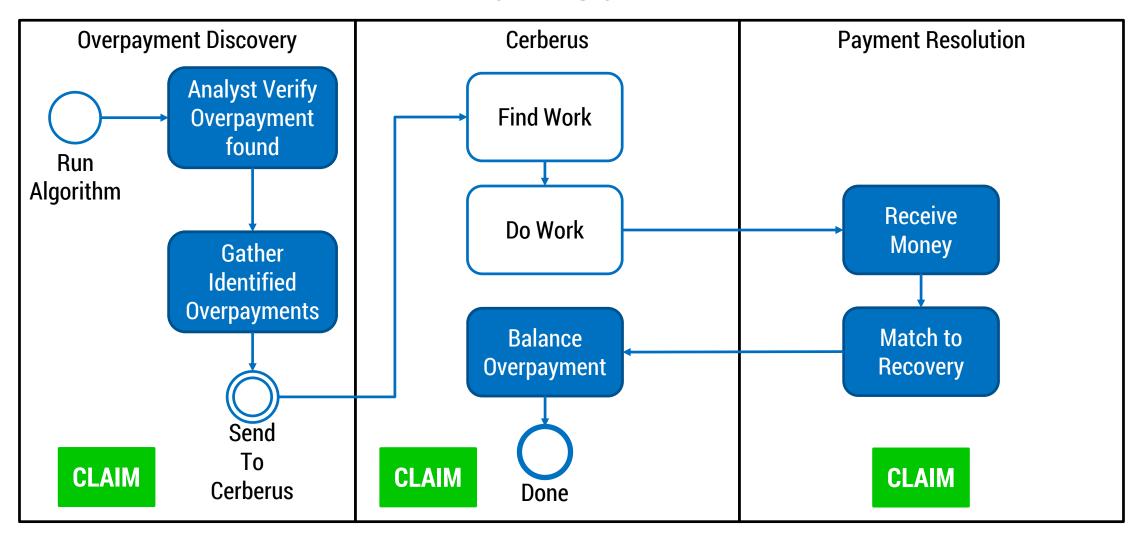


# Success



### **Tim's Mental Model 2**

**Payment Integrity** 

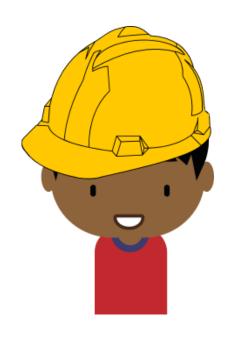


## **Tim the Architect**





## **Solution Architecture Document**





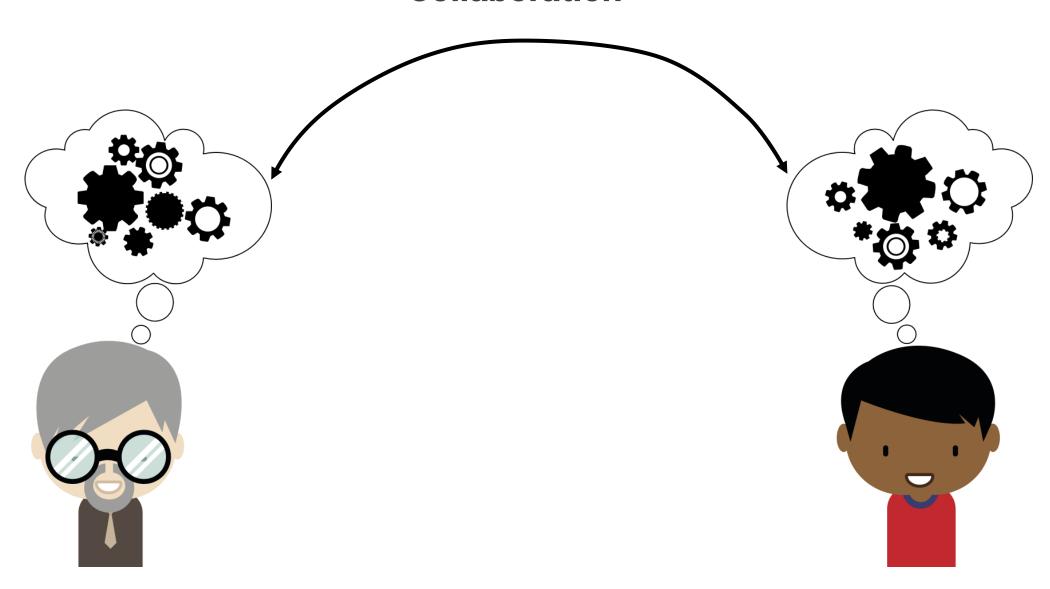
### The Guru

### **Attributes**

- Highly technical
- A sounding board for ideas
- Interested in tackling Essential Complexity
- Life long learner

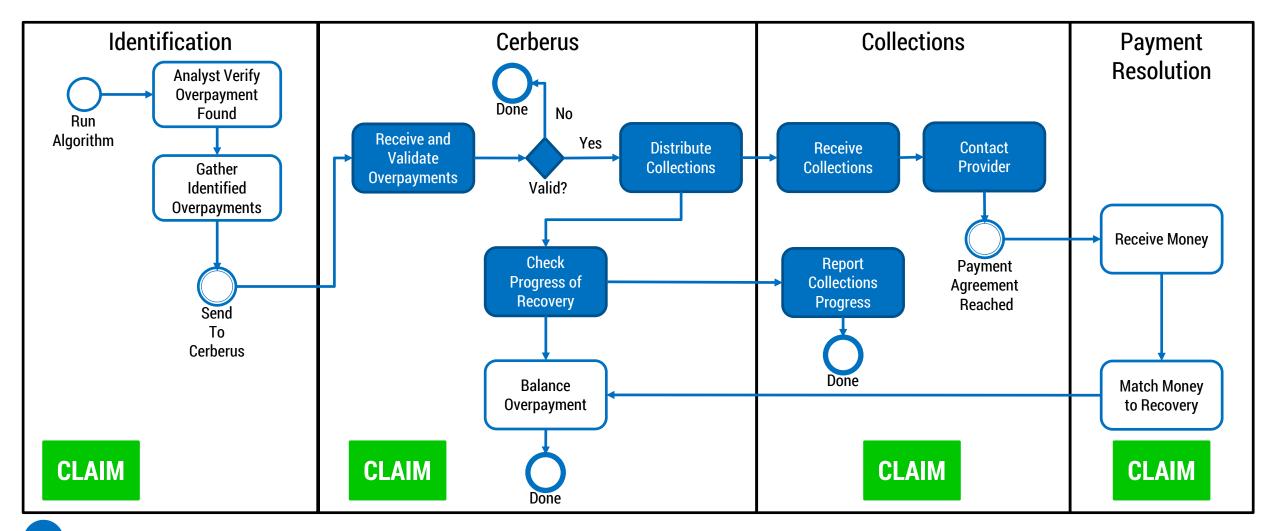


# Collaboration

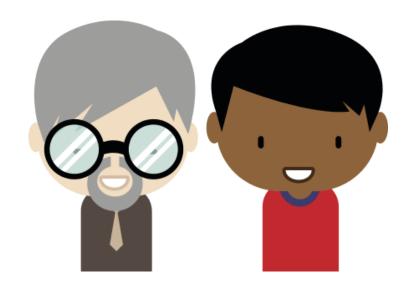


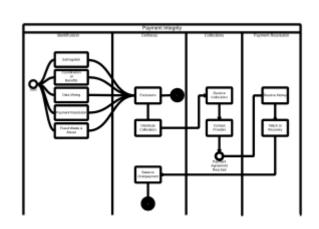
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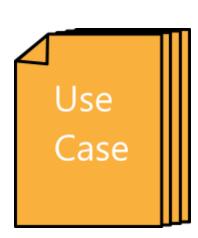
**Payment Integrity** 



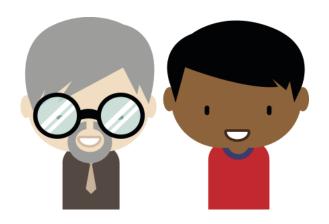
## **Validate Model**







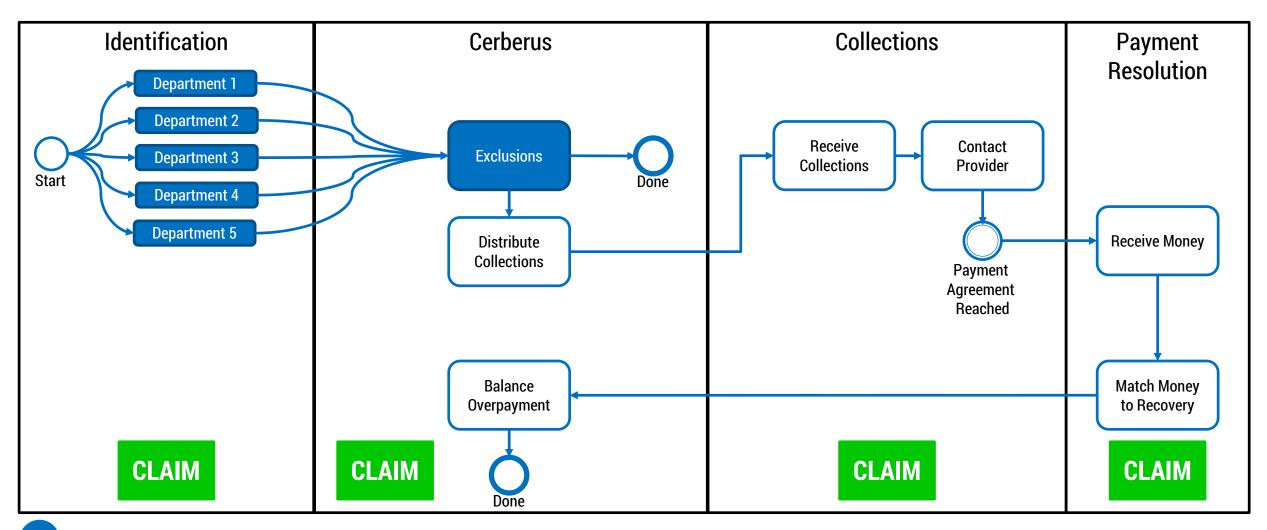
# **New Integration**



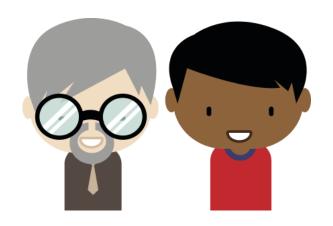


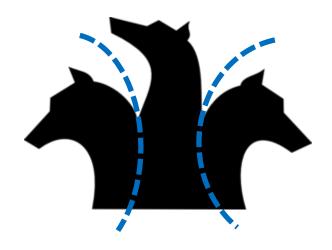
### **Tim's Mental Model 4**

**Payment Integrity** 



# Result





### **Database**

**Relational Data Model** 

# **Claim**

| ID | Claim# | SSN | Provider  | Identifier | Date     | Amount | Patient |
|----|--------|-----|-----------|------------|----------|--------|---------|
| 8  | 432345 | 111 | Hospital  | Subro      | 1/1/2015 | \$100  | Will    |
| 9  | 937626 | 222 | Physician | Algo       | 2/3/2016 | \$400  | Smith   |

# **Identifier**

| Short | Full Name   |
|-------|-------------|
| Subro | Subrogation |
| Algo  | Algorithm   |

# **Financial Line Item**

| ID | Claim Id | Amount | Credit/Debit |
|----|----------|--------|--------------|
| 77 | 8        | \$50   | Credit       |
| 78 | 9        | \$50   | Debit        |

# **Claim Line Item**

| ID  | Claim Id | Code  | Cost | Recovery |
|-----|----------|-------|------|----------|
| 322 | 8        | C43.4 | \$50 | True     |
| 323 | 8        | L04.0 | \$30 | False    |

### **Business Model**

**Relational Business Model** 

#### **Identifier**

Short: string

FullName: string

### **FinancialLineItem**

ID: int

ClaimId: int

Amount: decimal

CreditDebit: string

#### Claim

ID: int

ClaimNum: string

SSN: string

**Provider: string** 

**Identifer: Identifier** 

LineItems: List<ClaimLineItem>

Financials: List<FinancialLineItem>

#### ClaimLineItem

ID: int

ClaimId: int

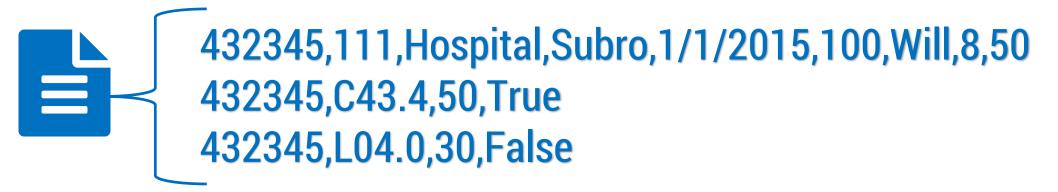
Code: string

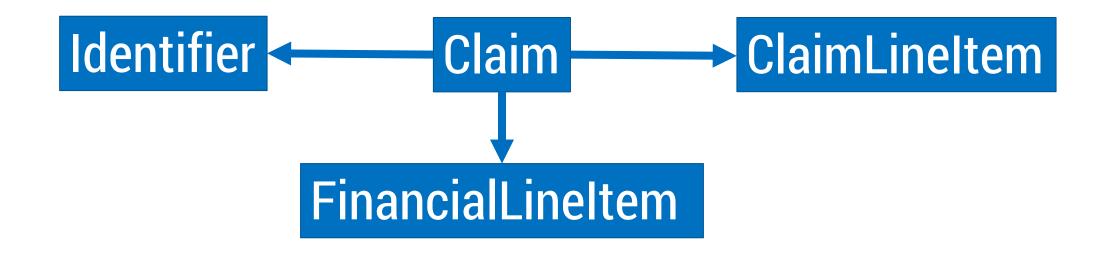
Cost: decimal

Recovery: bool

## **Data Import**

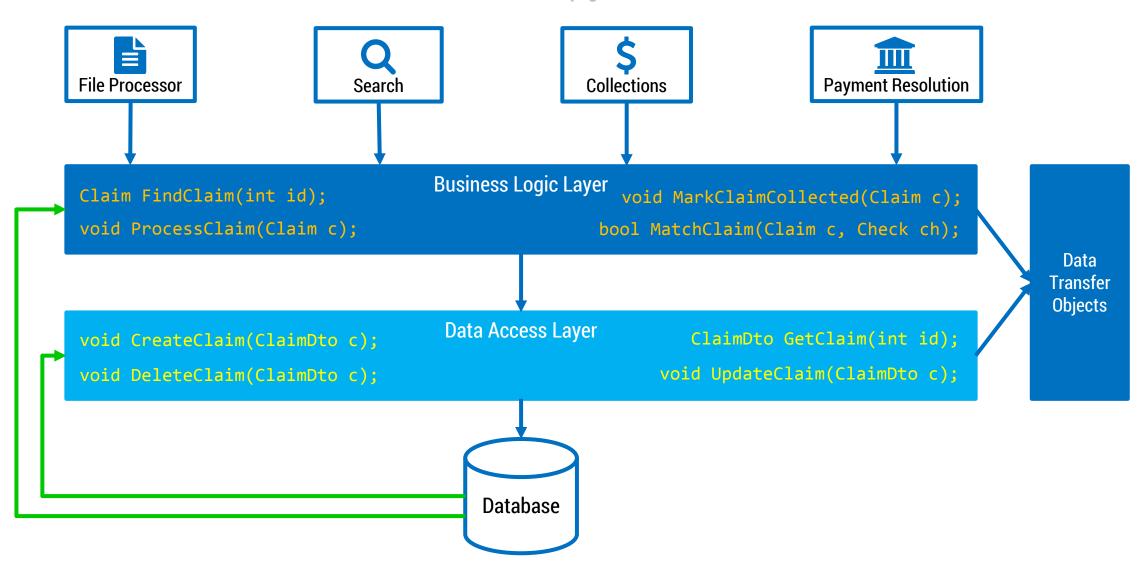
**Relational Business Model** 





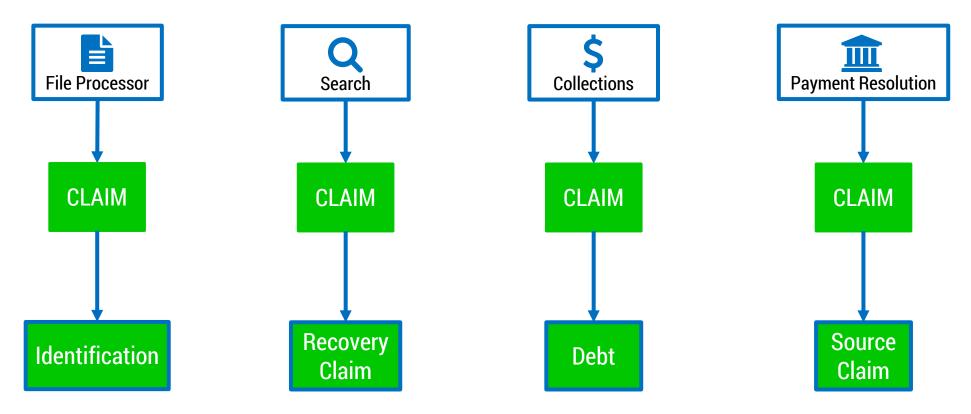
## **Data Centric Design**

**Relational Model Propagated** 

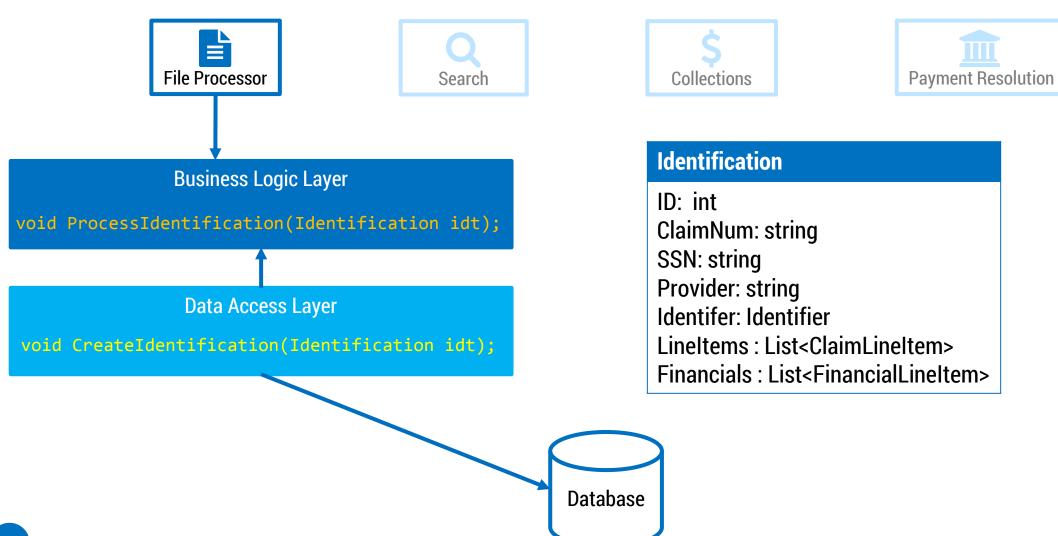


## **Domain Driven Design**

**Utilize Bounded Context** 



**File Processor** 

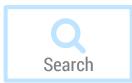


Search Collections **Payment Resolution** File Processor Search **Business Logic Layer** RecoveryClaim RecoveryClaim FindRecoveryClaim(int id); ID: int ClaimNum: string SSN: string **Data Access Layer** Provider: string RecoveryClaim GetRecoveryClaim(int id); **Amount: Decimal** 

Database

**Collections** 







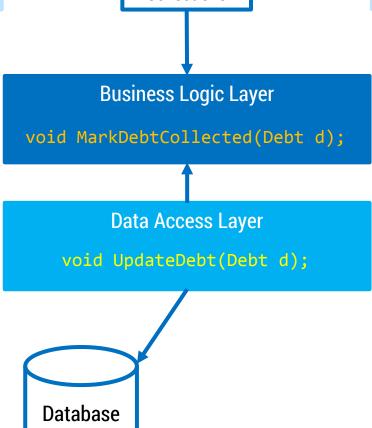


#### **Debt**

ID: int

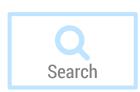
ClaimNum: string Provider: string Amount: decimal

LineItems: List<ClaimLineItem>



**Payment Resolution** 









#### **SourceClaim**

ID: int

ClaimNum: string

OutstandingAmount: decimal

LineItems: List<ClaimLineItem>

**Business Logic Layer** 

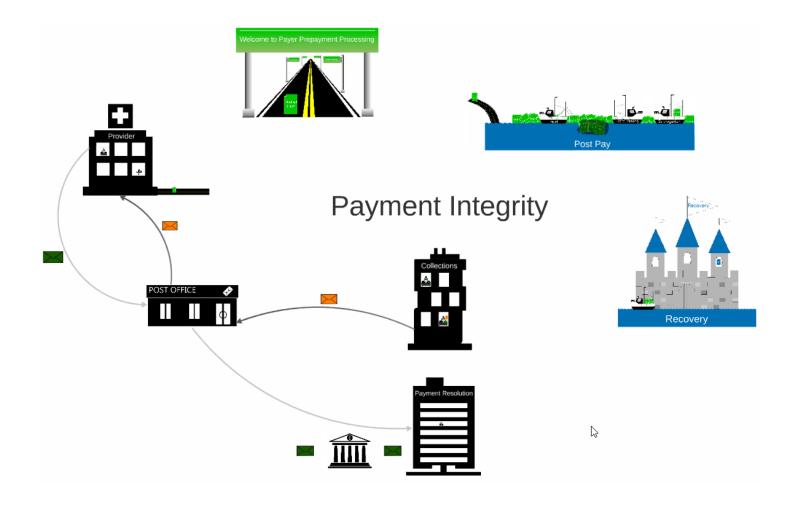
bool MatchClaimToCheck(SourceClaim c, Check ch);

**Data Access Layer** 

void UpdateCheck(Check c);

Database

### Prezi

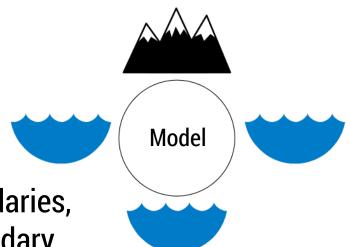


## **What Could Have Been**





**Bounded Context** 



- Bounded Contexts are models with explicit boundaries, where the model is unambiguous within the boundary
- Bounded Contexts are useful in many different architectural styles
- Identifying Bounded Contexts requires significant effort, so focus on your core business
- Many large business applications would derive value from utilizing Bounded Contexts

**On Boarding** 



- Focus on the essential complexity, the domain
- It takes time for humans to digest new information
- A person will not gain deep knowledge without asking questions

The Oracle



- Identify an Oracle and/or business users to help refine the model
- Learn how to shape questions in business terms
- Software design is a collaborative process and requires open communication between business users and developers

The Guru



- Stitch together other peoples' experience to create a larger model
- Identify a Guru to use as a sounding board
- Use relationships with gray beards to establish context of decisions
- Utilize Use Cases to continually validate the model
- Take time to analyze the problem domain

**New Integration** 



- Identify all upstream and downstream business users
- Learn about how the business units who interact with your system are divided and what their responsibilities are

#### References

- Greg Young CQRS/DDD talks extensively about bounded context
  - https://youtu.be/KXqrBySgX-s
- Udi Dahan CQRS and DDD
  - https://youtu.be/EkEz3pcLdgY
- A good discussion of Bounded Context
  - http://programmers.stackexchange.com/questions/237513/what-in-reference-to-ddd-is-a-bounded-context
- Eric Evans Domain Driven Design
  - http://www.infoq.com/presentations/model-to-work-evans
- Bounded Context Discussion
  - http://culttt.com/2014/11/19/bounded-contexts-context-maps-domain-driven-design/
- Eric Evans 5 Years after DDD pushed
  - http://dddcommunity.org/library/evans\_2009\_1/
- Discussion of importance of bounded context
  - <a href="http://eventuallyconsistent.net/2012/05/14/why-bounded-context-really-matters/">http://eventuallyconsistent.net/2012/05/14/why-bounded-context-really-matters/</a>
- Definition of Context
  - http://www.urbandictionary.com/define.php?term=context
- Bounded Context Defintion
  - http://martinfowler.com/bliki/BoundedContext.html
- Context and Context Mappings in DDD
  - http://www.infoq.com/articles/ddd-contextmapping