

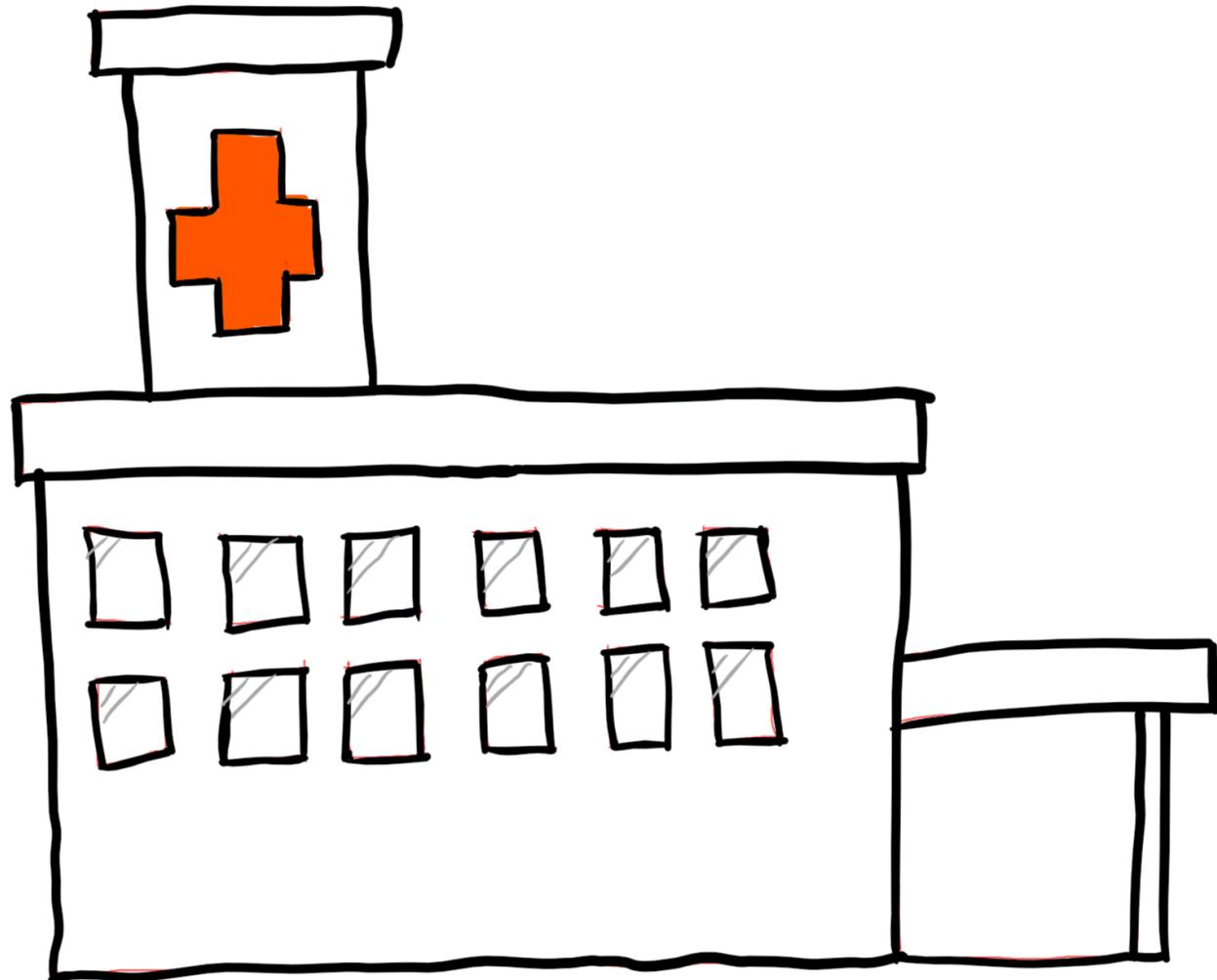
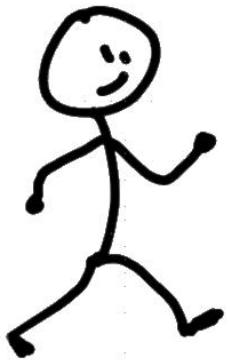
THINKING  
IN EVENTS

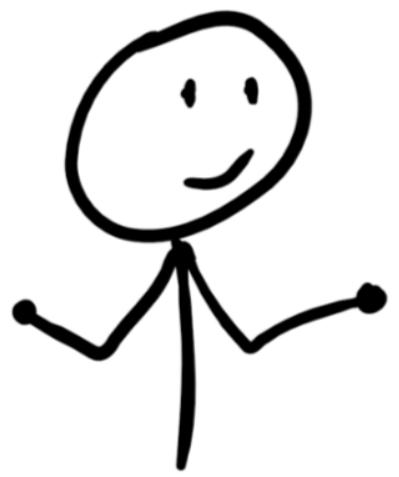
WHY THIS  
TALK

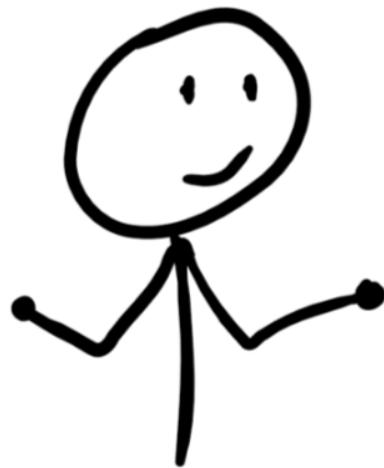
WHAT ARE WE  
COVERING

THE  
DOMAIN

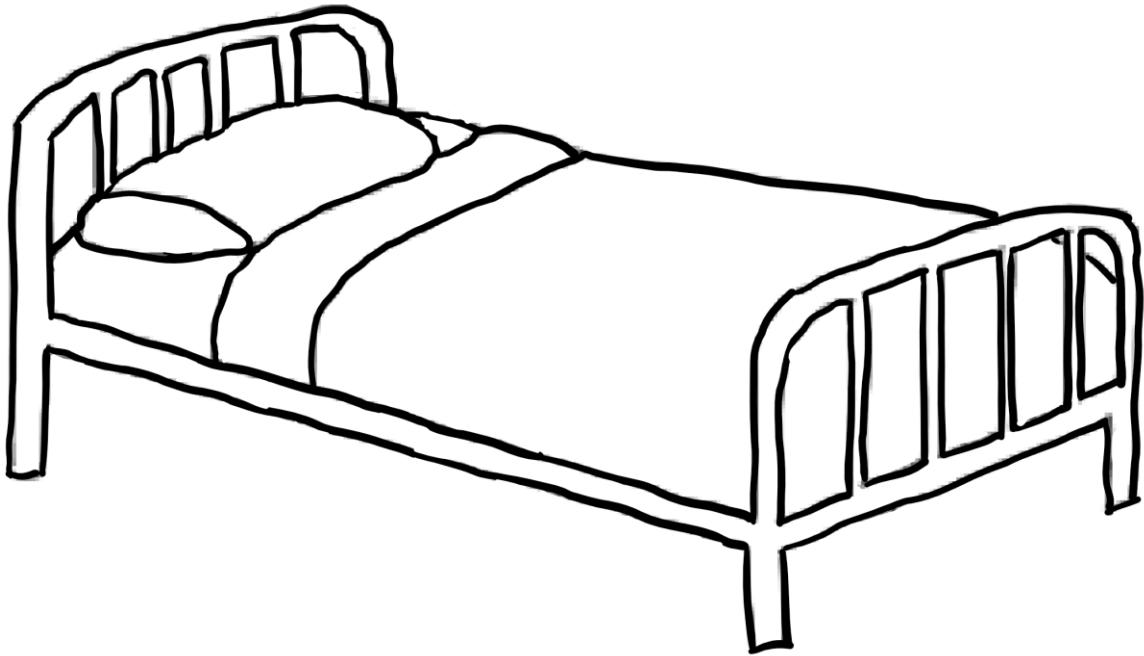
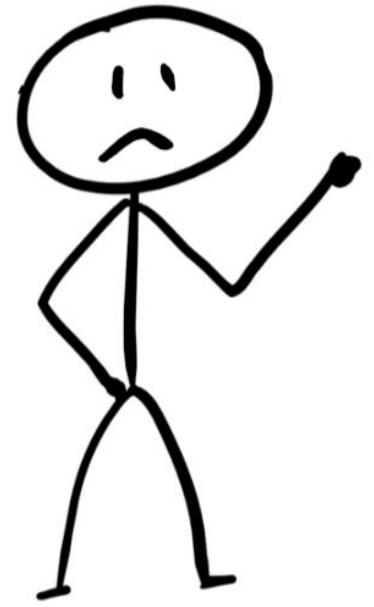
190

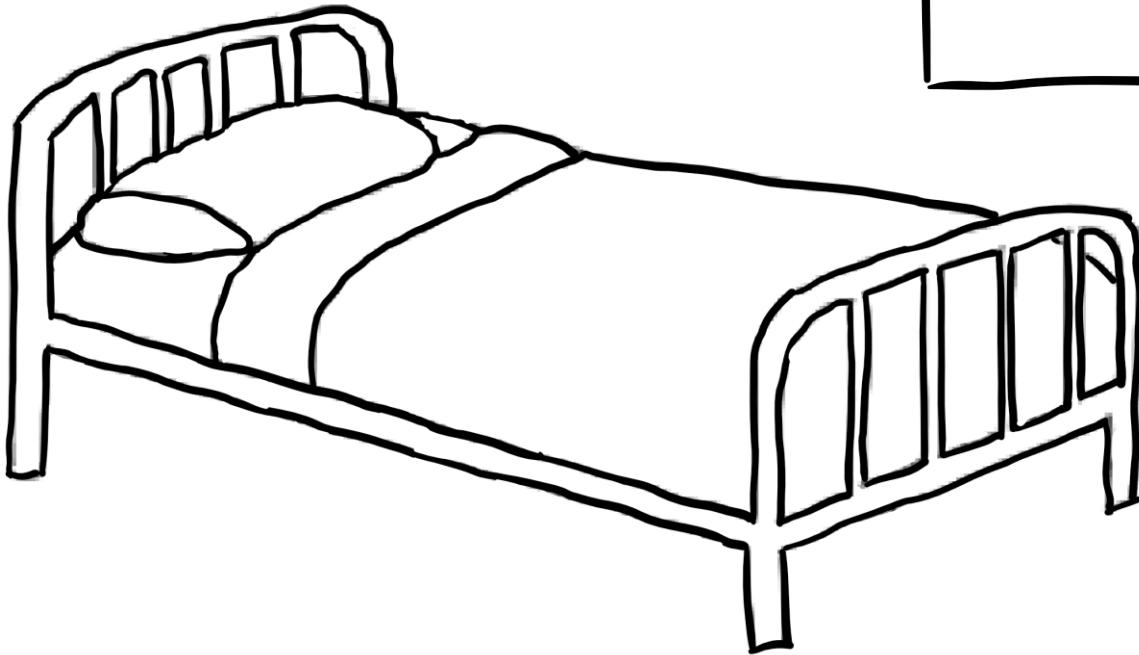
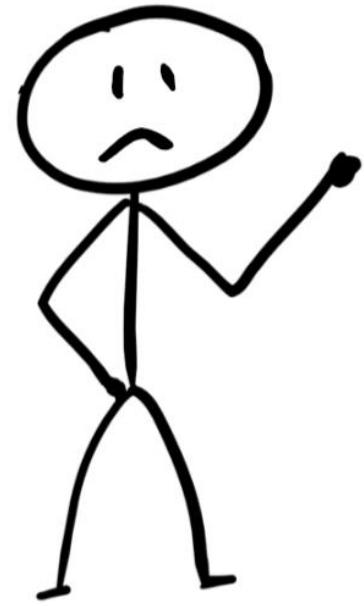




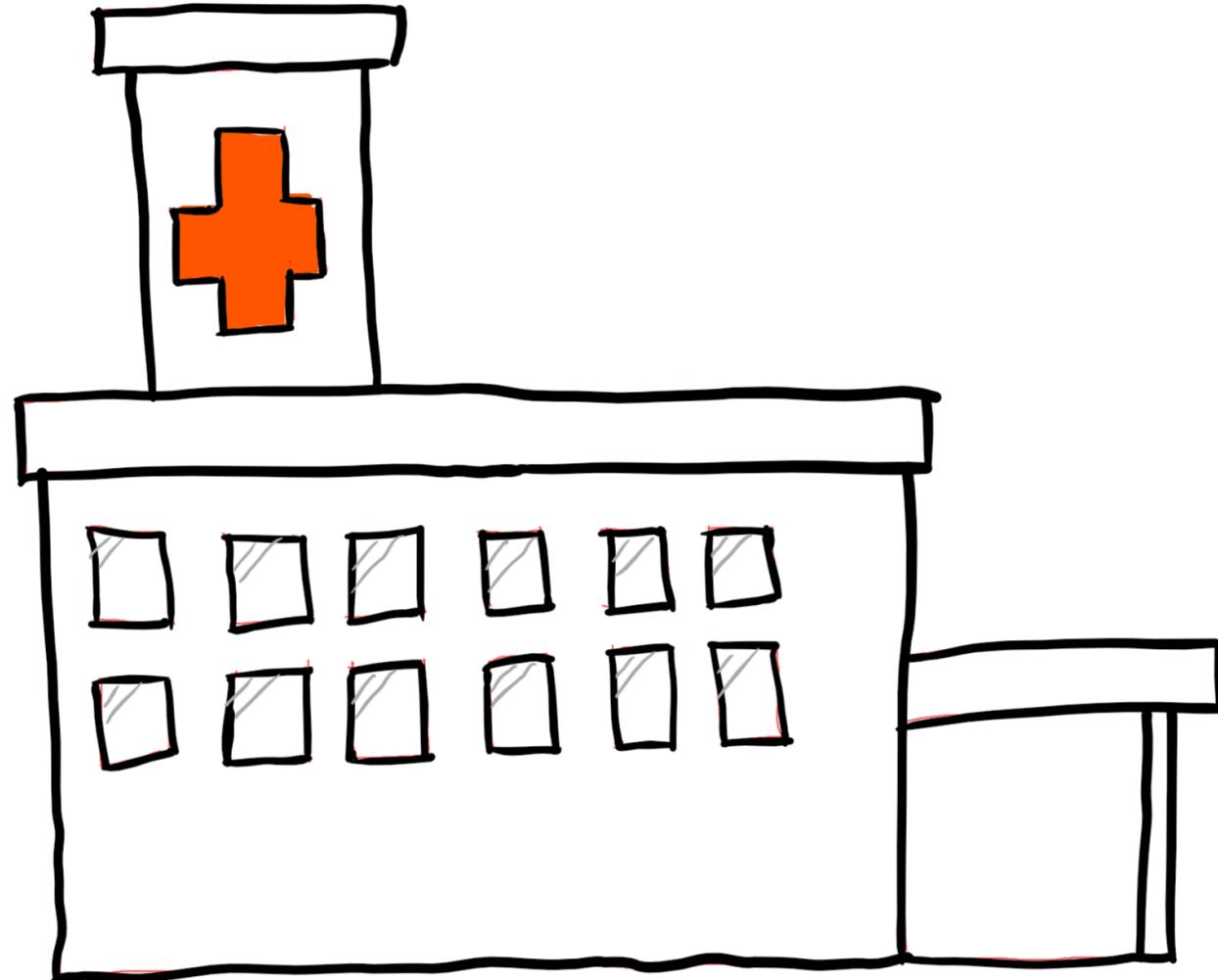
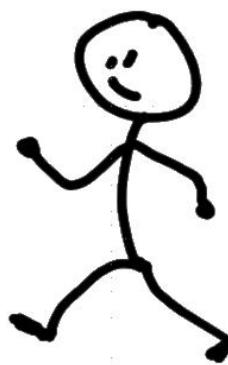


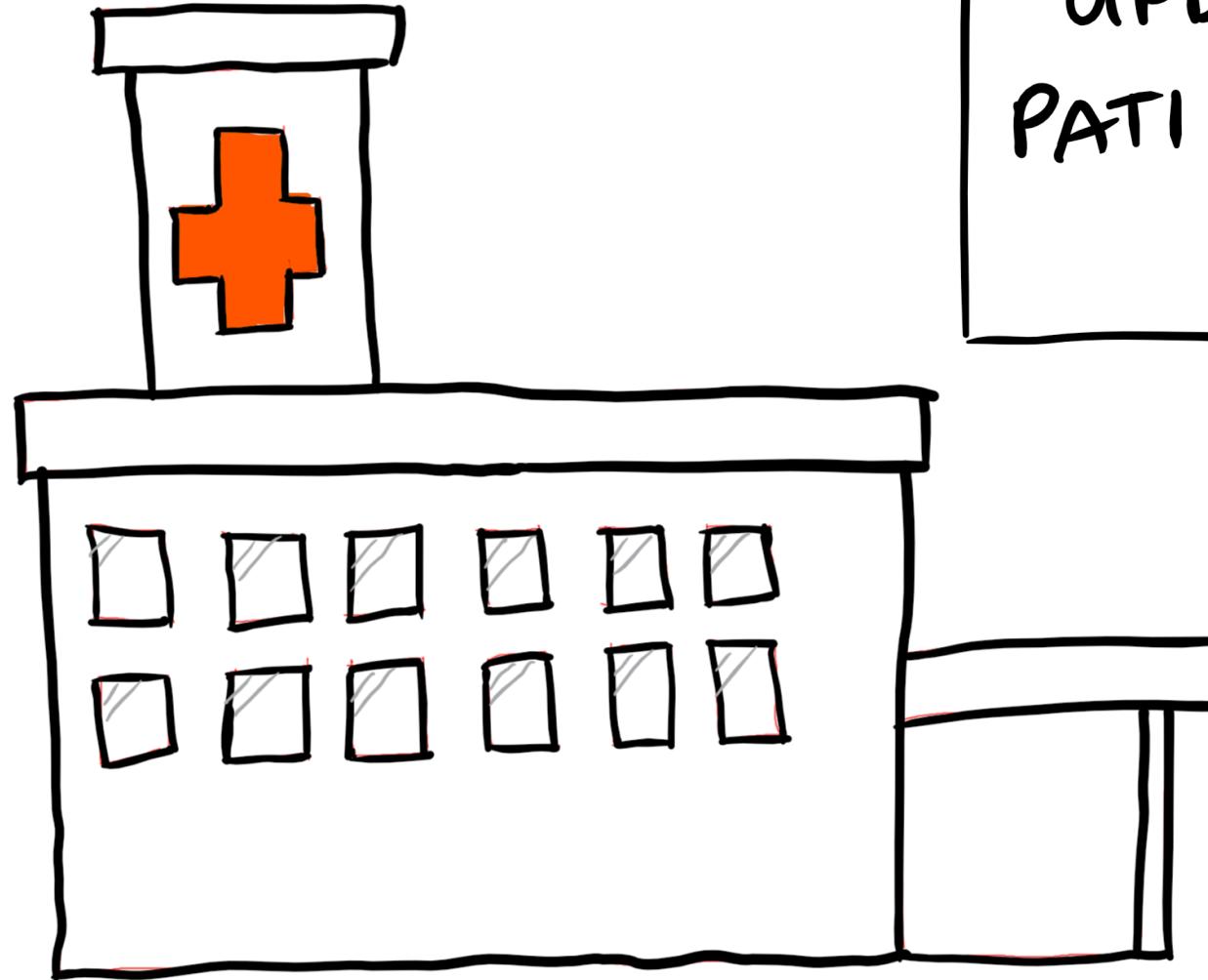
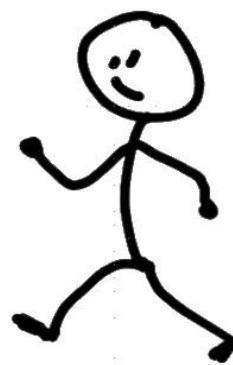
CREATE  
PATIENT





UPDATE  
PATIENT





ITS NOT HOW  
PEOPLE THINK

EVENT



UPDATE

WHAT IS A  
DOMAIN EVENT?

- DESCRIBED IN PAST TENSE
- EXPRESSED USING A USUAL LANGUAGE
- SOMETHING YOUR DOMAIN EXPERTS CARE ABOUT

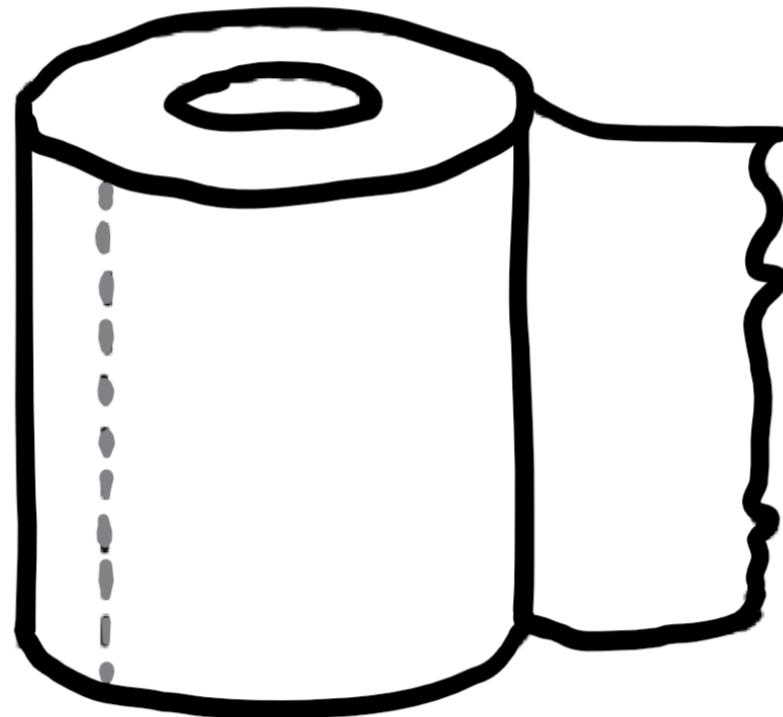
TIME



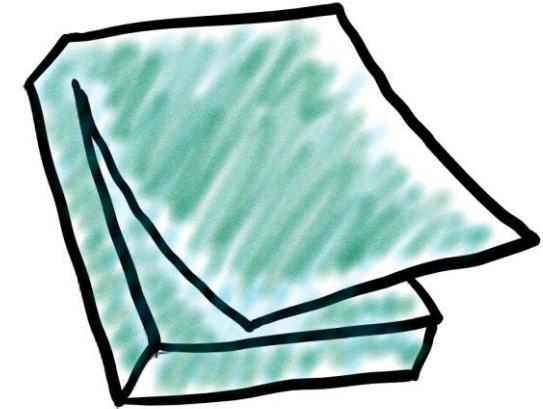
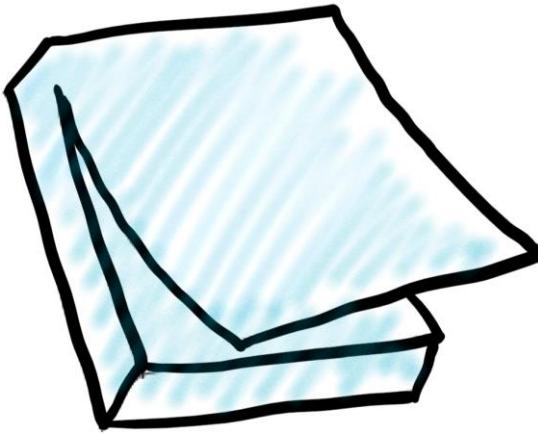
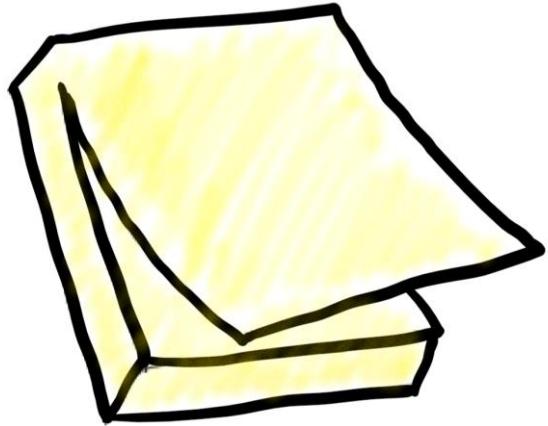
EVENT

STORMING

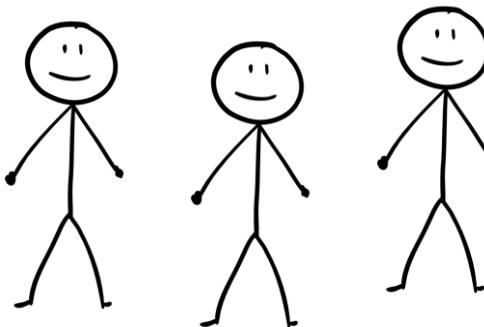
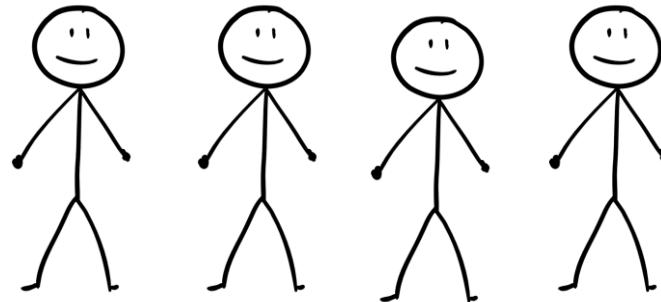
# ROLL OF PAPER

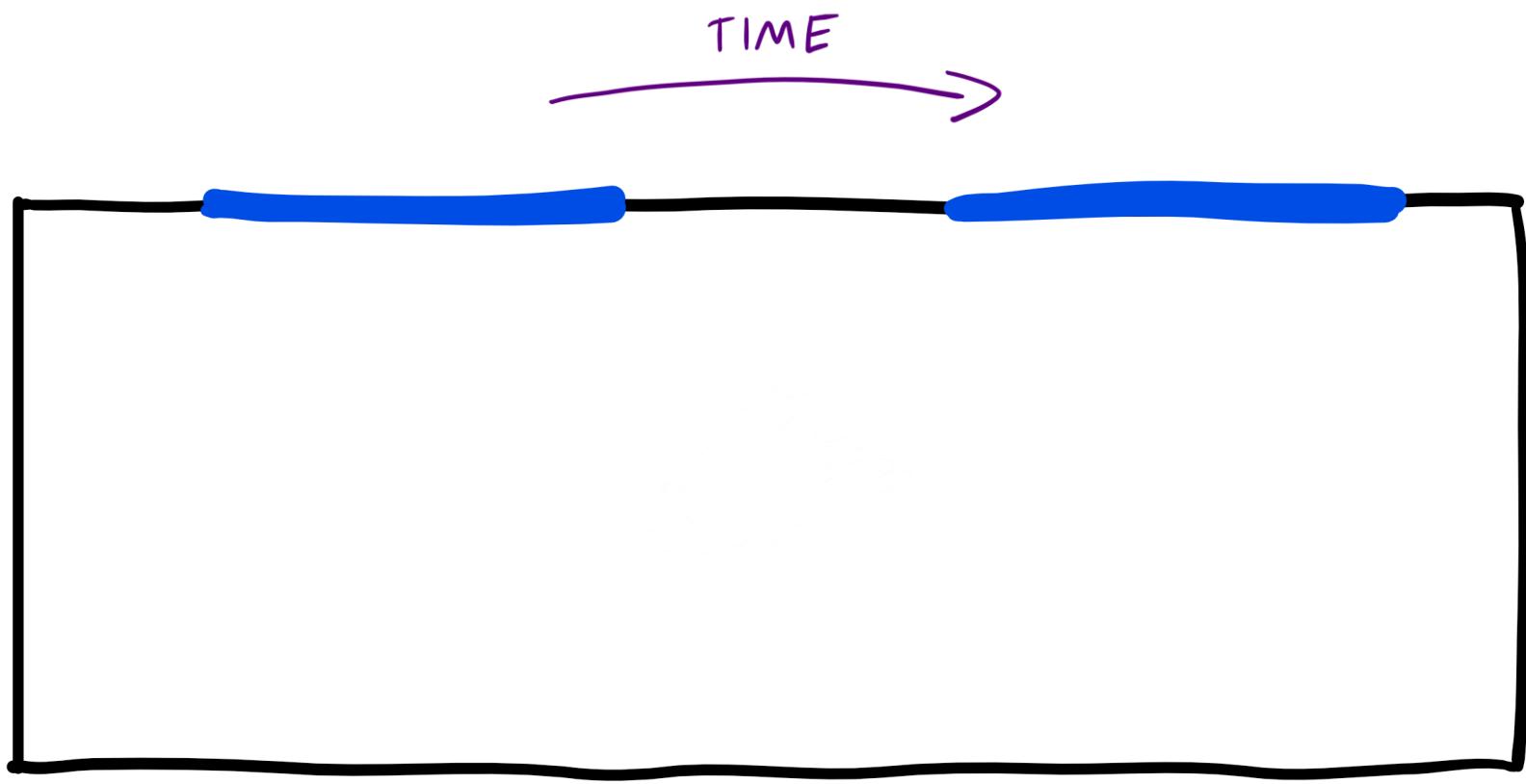


# STACK OF POST-HIS



# DOMAIN EXPERTS

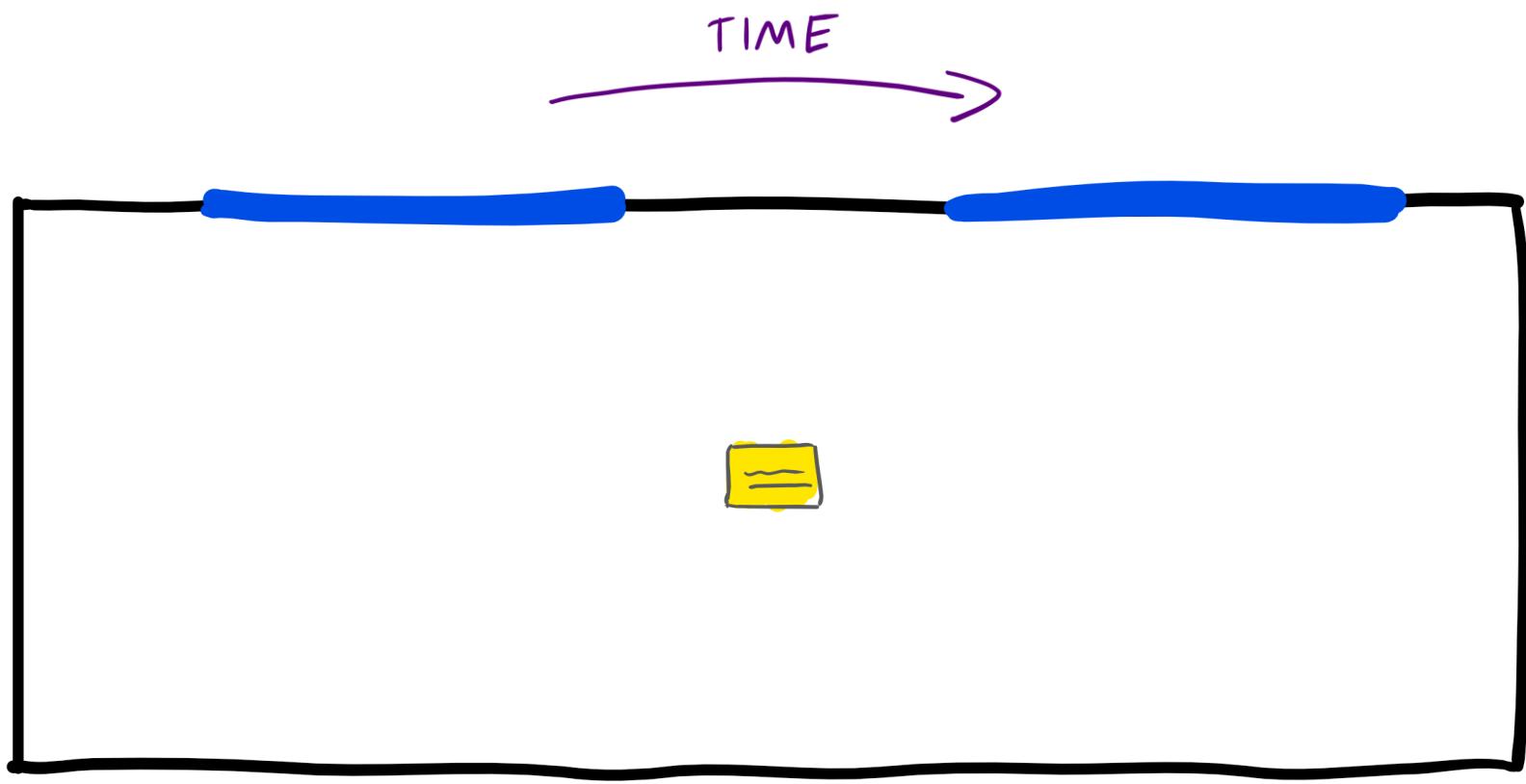


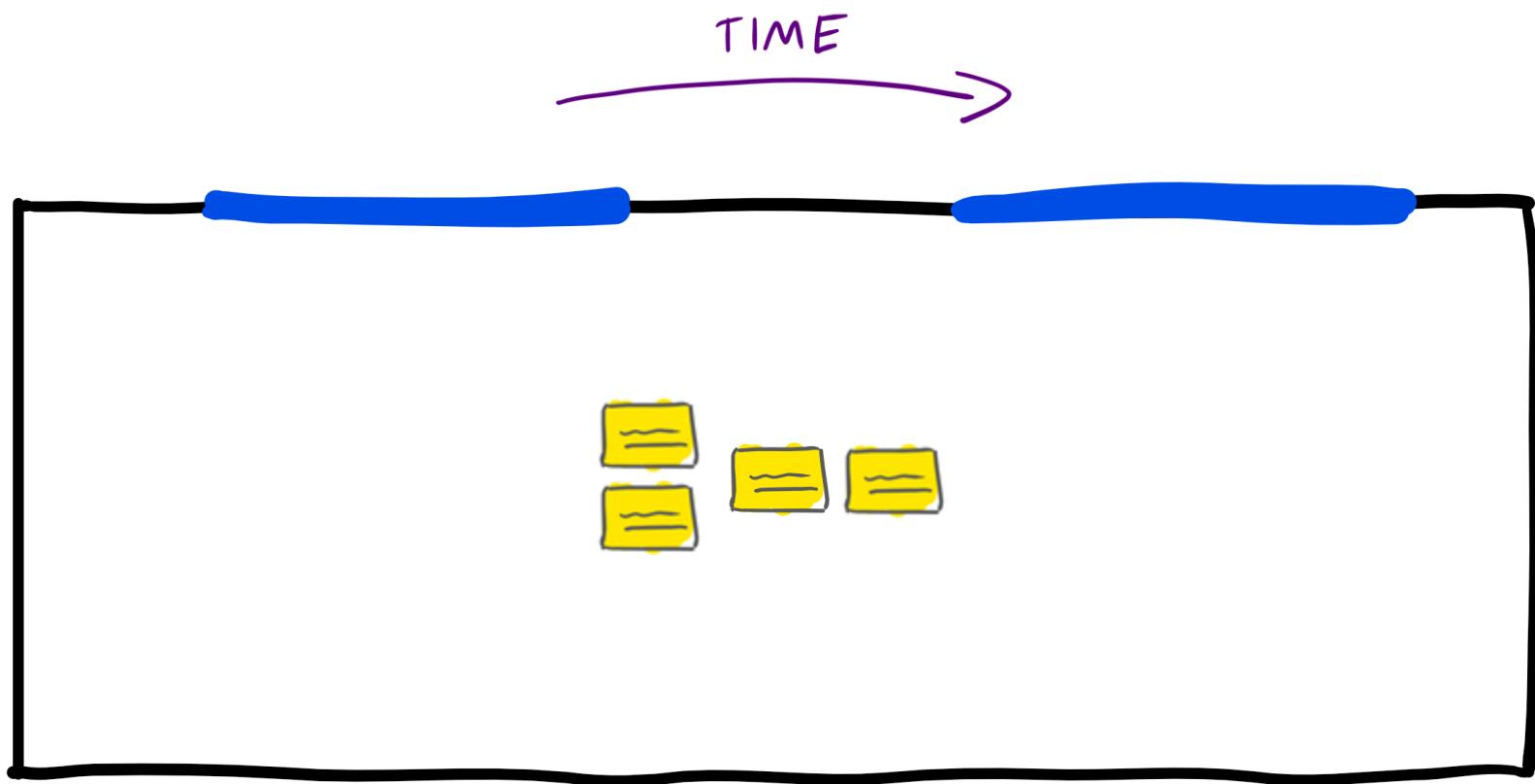


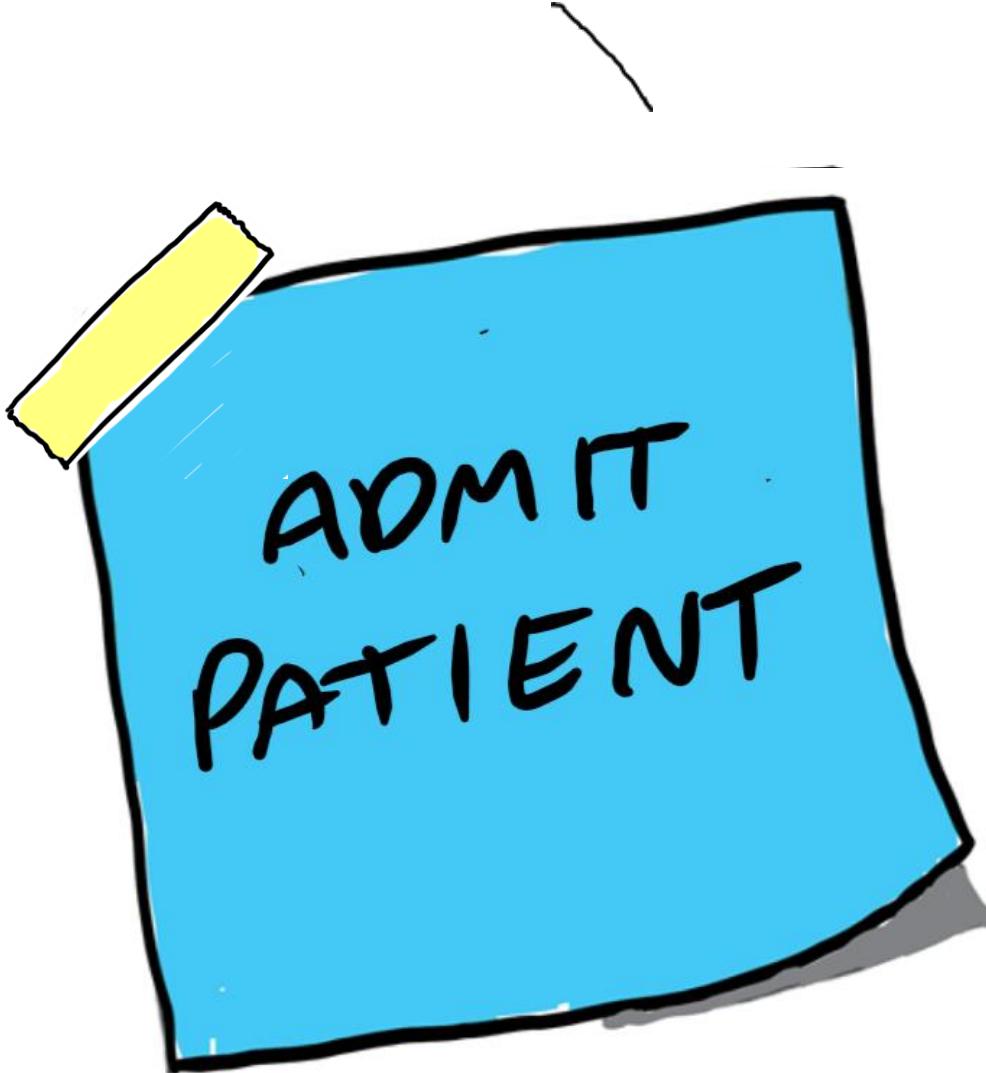


## DOMAIN EVENT

- DESCRIBED IN PAST TENSE
- EXPRESSED USING A USICUTOUS LANGUAGE
- SOMETHING YOUR DOMAIN EXPERTS CARE ABOUT

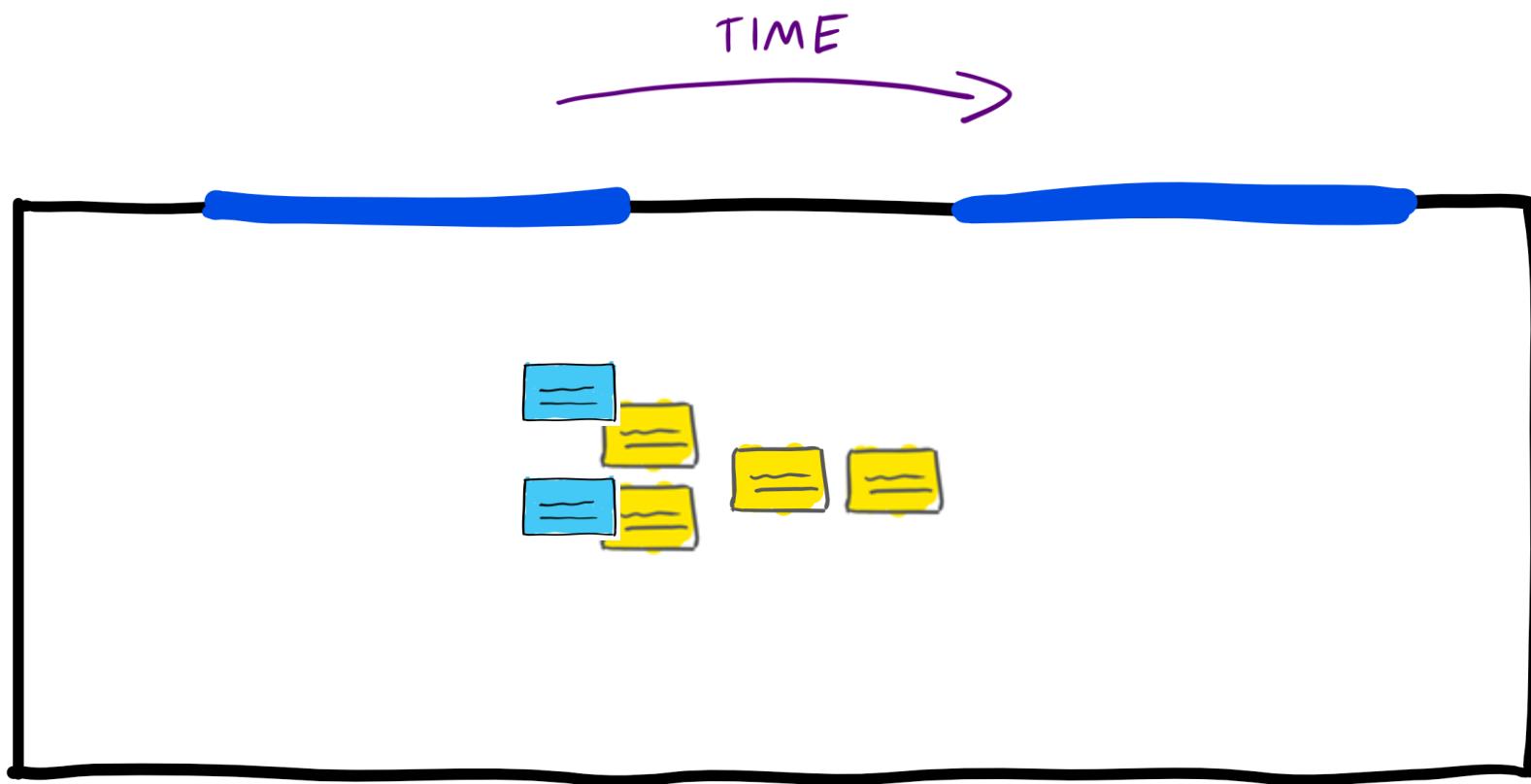






## COMMAND/ACTION

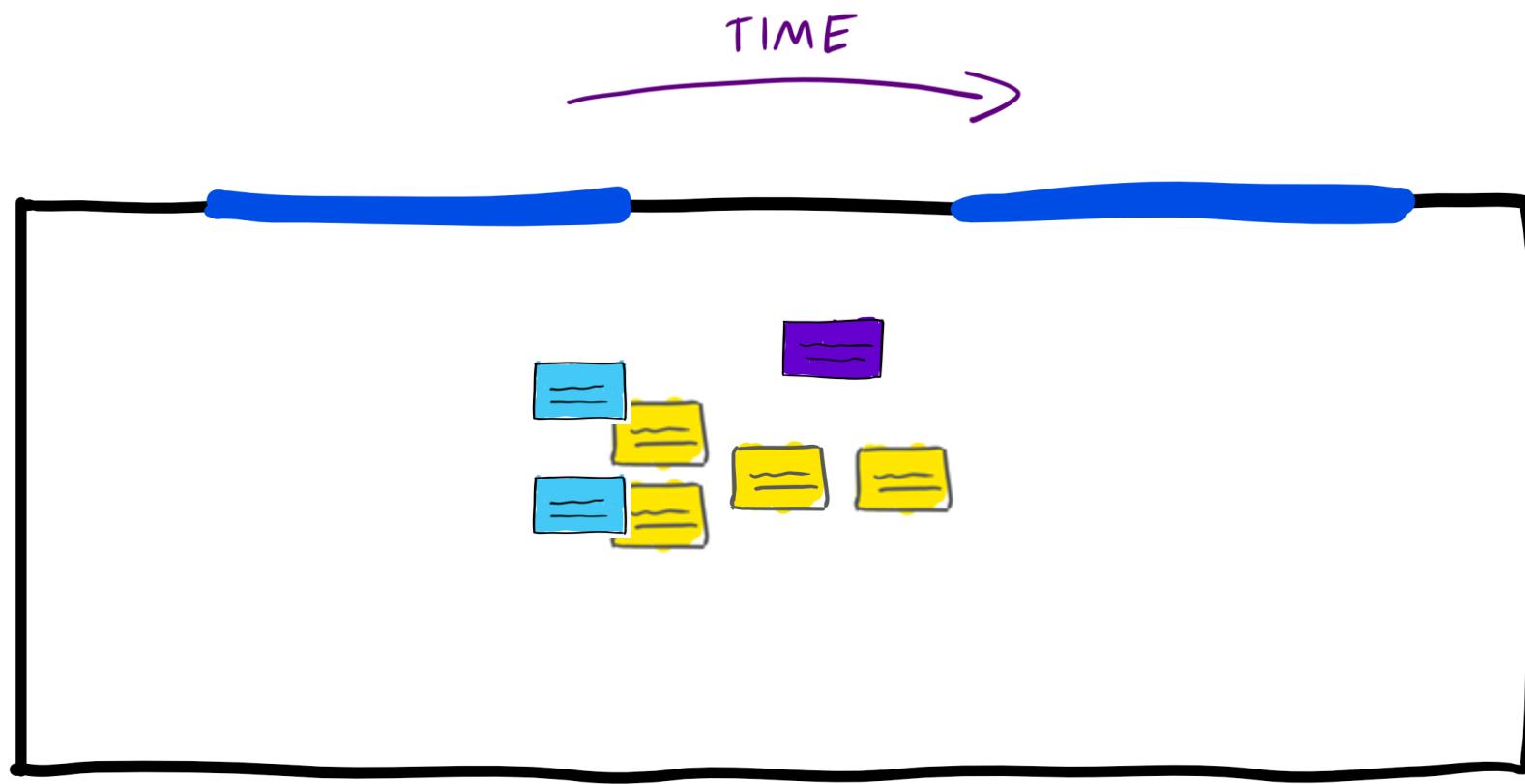
- USER INTERACTION
- LEADS TO EVENT GENERATION
- PRESENT TENSE





## EXTERNAL EVENTS

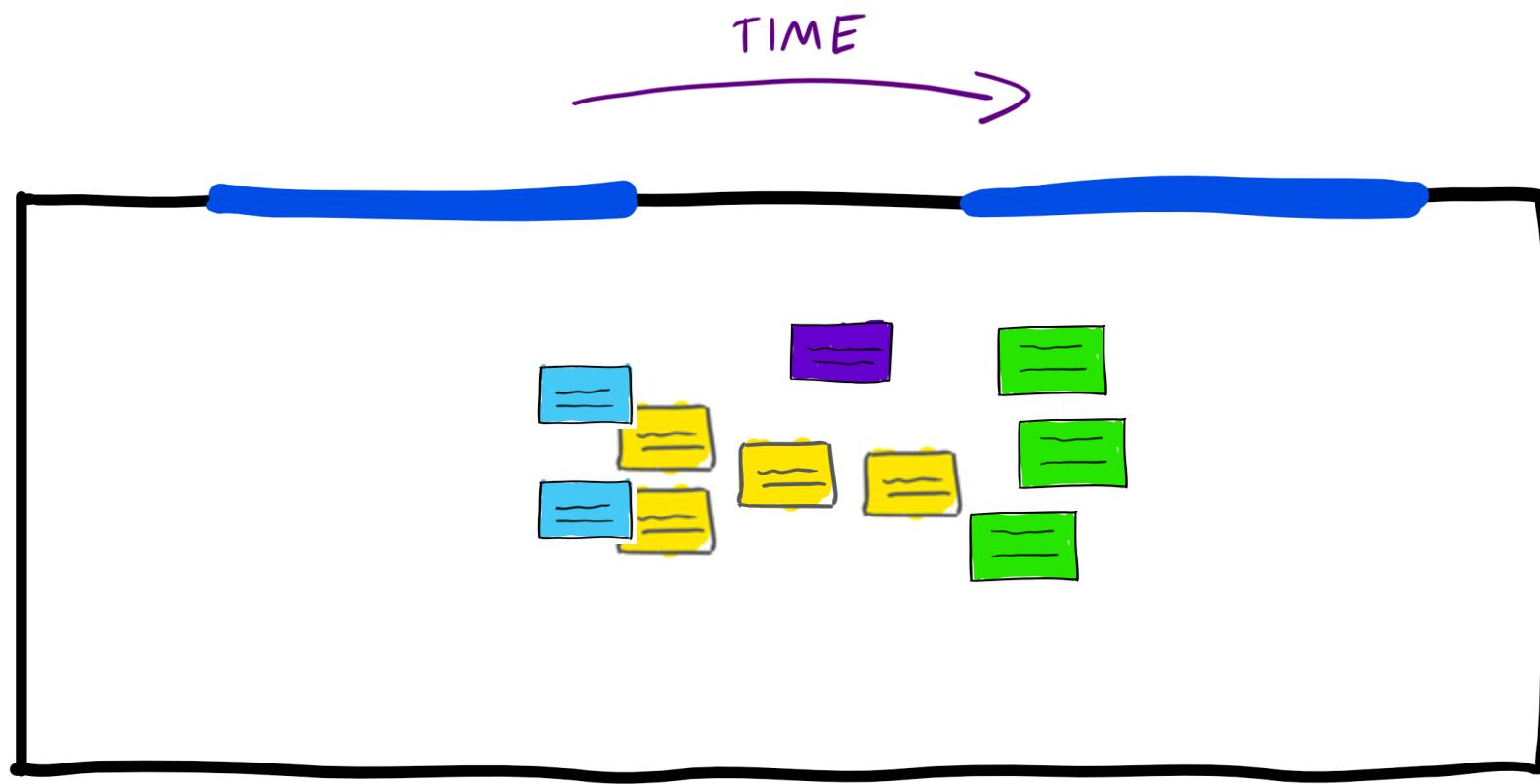
- EVENTS FROM EXTERNAL SYSTEMS
- EVENTS FROM OTHER APPLICATIONS IN THE BUSINESS
- THINGS NOT UNDER YOUR CONTROL

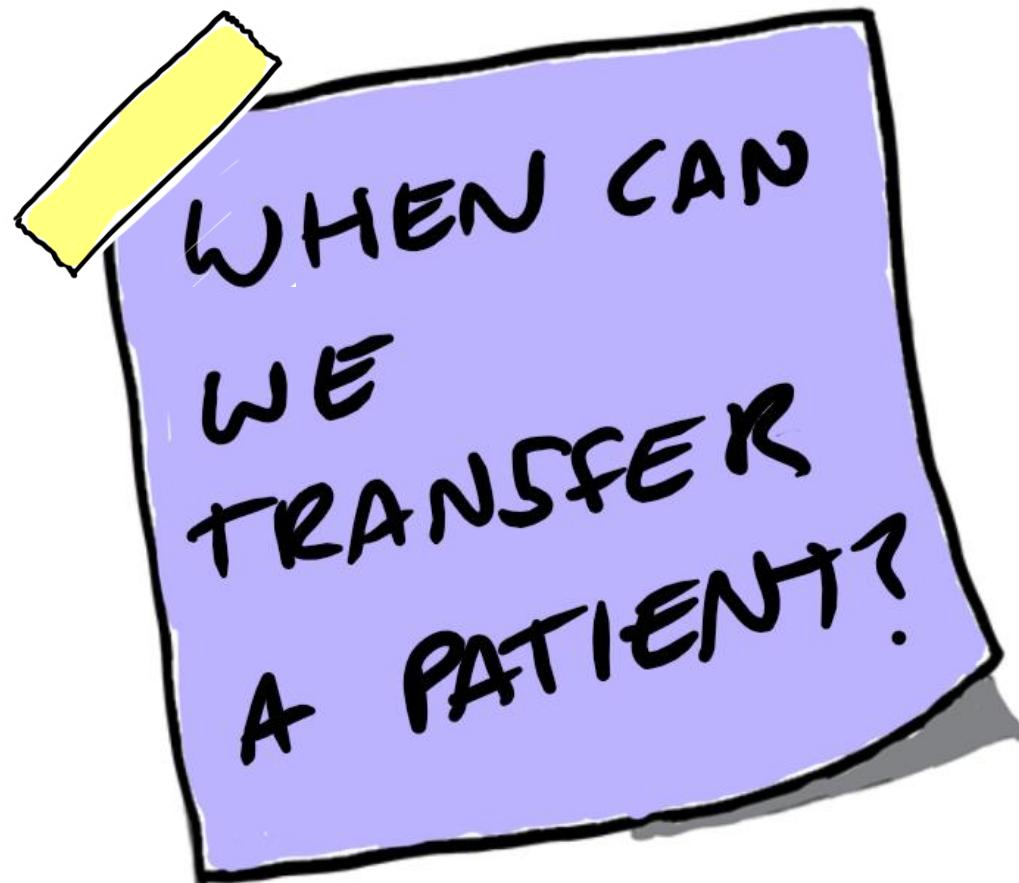




## READ MODEL

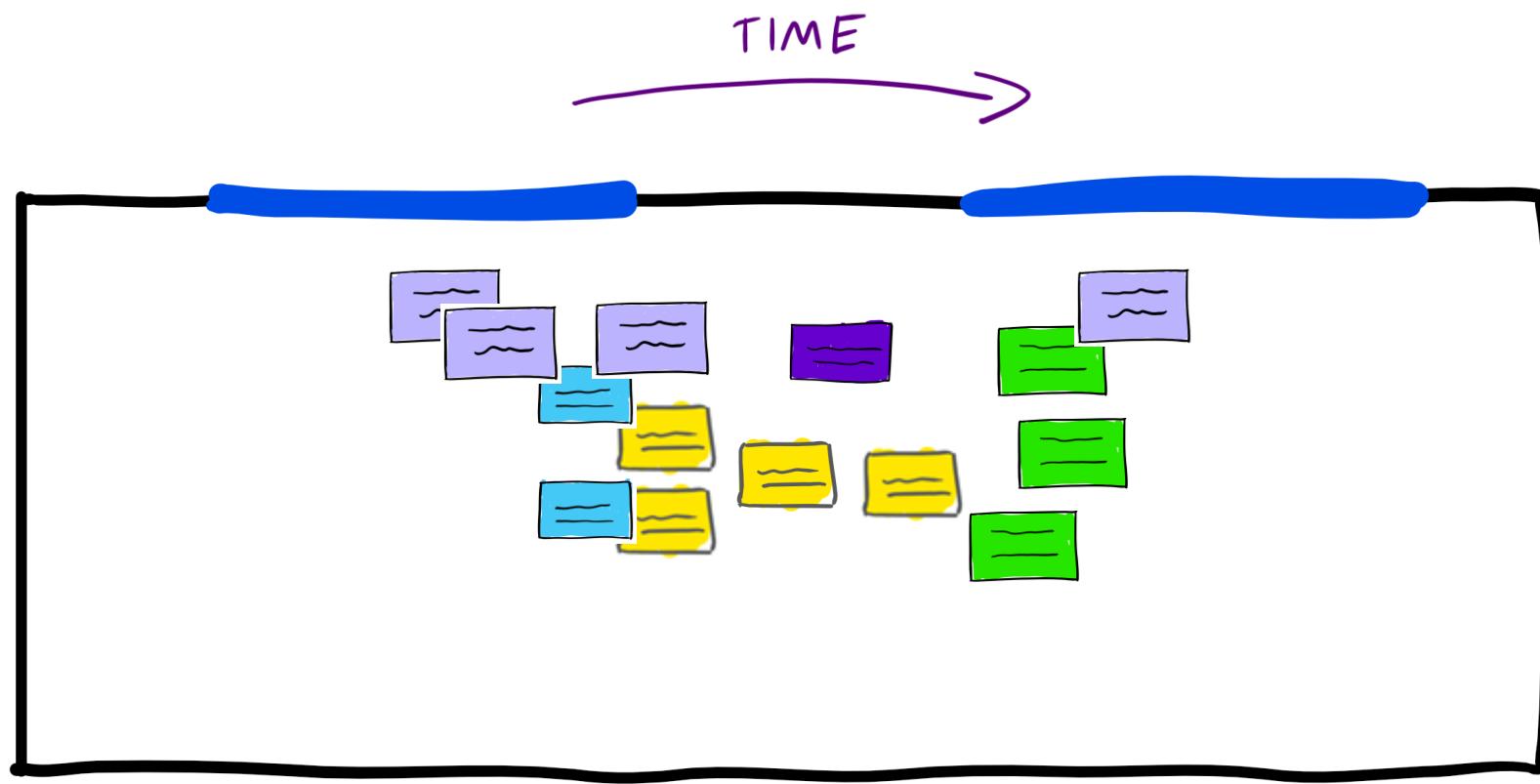
- INFORMATION FOR THE USER
- USED TO PROVIDE INFO FOR YOUR COMMANDS





# QUESTIONS?

- CAN IT BE ANSWERED NOW
- IS THE RIGHT PERSON HERE
- POSTPONE IT?



ADMIT  
PATIENT

PATIENT  
ADMITTED

WHEN CAN  
THEY TRANSFER ?

PATIENT  
TRANSFERRED

PATIENT  
DISCHARGED

ADMISSION  
FROM ADT

DEMOGRAPHICS

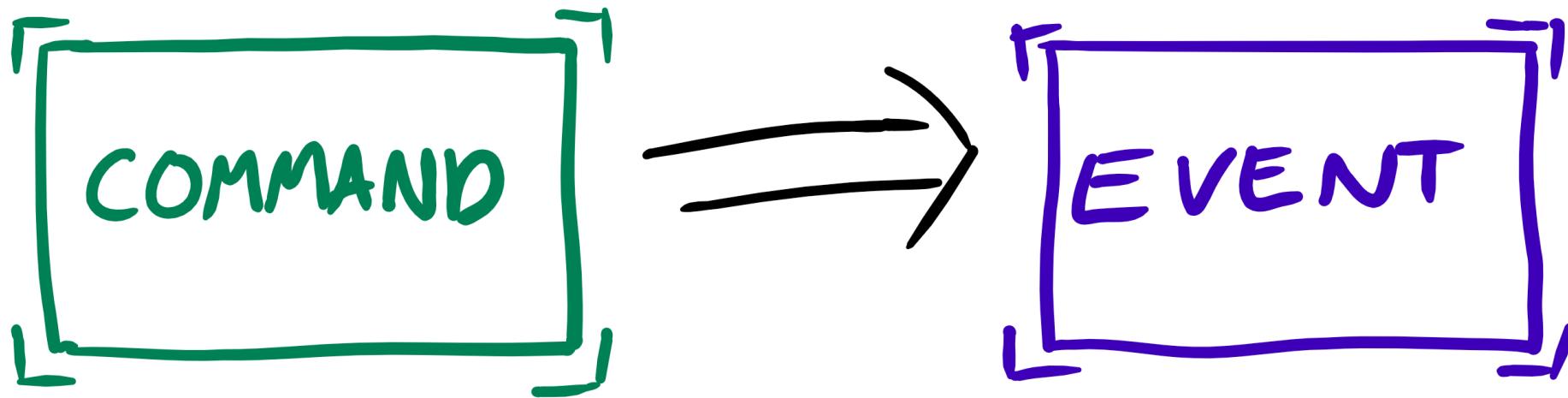
WARD  
VIEW

# TIPS

- LOTS OF SPACE
- NO CHAIRS
- DON'T LET THINGS STALL

# BENEFITS

- HELPS WITH UNDERSTANDING
- VISUAL
- UNCOVERS PROBLEMS
- FUN



- THE DECISION
- THE PROVIDED INFORMATION
- THE RESULT
- WHEN IT CAN BE MADE

- THE DECISION IS TO TRANSFER THE PATIENT
- THE INFORMATION REQUIRED IS THE NEW WARD
- THE RESULT IS THE PATIENT IS TRANSFERRED
- THE DECISION CAN BE MADE AS LONG AS THE PATIENT IS ADMITTED

EVENT SOURCING

# ADMIT PATIENT()

Patient  
Id: 04e3b534-8a40-4180-a7ed-d5afaa45a858  
Name: Tony Ferguson  
Age: 32  
Ward: 10  
IsAdmitted: true

# TRANSFERPATIENT()

Patient  
Id: 04e3b534-8a40-4180-a7ed-d5afaa45a858  
Name: Tony Ferguson  
Age: 32  
Ward: 76  
IsAdmitted: true

# TRANSFERPATIENT()

Patient  
Id: 04e3b534-8a40-4180-a7ed-d5afaa45a858  
Name: Tony Ferguson  
Age: 32  
Ward: 34  
IsAdmitted: true

# DISCHARGEPATIENT()

Patient  
Id: 04e3b534-8a40-4180-a7ed-d5afaa45a858  
Name: Tony Ferguson  
Age: 32  
Ward: null  
IsAdmitted: false

# ADMIT PATIENT()

Patient  
Id: 04e3b534-8a40-4180-a7ed-d5afaa45a858  
Name: Tony Ferguson  
Age: 32  
Ward: 10  
IsAdmitted: true

# TRANSFERPATIENT()

Patient  
Id: 04e3b534-8a40-4180-a7ed-d5afaa45a858  
Name: Tony Ferguson  
Age: 32  
Ward: 76  
IsAdmitted: true

# TRANSFERPATIENT()

Patient  
Id: 04e3b534-8a40-4180-a7ed-d5afaa45a858  
Name: Tony Ferguson  
Age: 32  
Ward: 34  
IsAdmitted: true

# DISCHARGE PATIENT()

Patient  
Id: 04e3b534-8a40-4180-a7ed-d5afaa45a858  
Name: Tony Ferguson  
Age: 32  
Ward: null  
IsAdmitted: false

PatientAdmitted  
Id: 04e3b534-8a40-41...  
Name: Tony Ferguson  
Age: 32  
Ward: 10

PatientTransferred  
Id: 04e3b534-8a40-41...  
ToWard: 76

PatientTransferred  
Id: 04e3b534-8a40-41...  
ToWard: 34

PatientDischarged  
Id: 04e3b534-8a4a...

Event Store - Stream X +

← → ⏪ | localhost:2113/index.html#/streams/CustomerOrder-15150a316a04444aaff7dafa64b0369c | ☰ ☆ | ⌂ ⌚ ⌚ ...

 EVENT STORE.

Dashboard Stream Browser Projections Query Admin Users Log Out

## Event Stream 'CustomerOrder-15150a316a04444aaff7dafa64b0369c'

Edit ACL Back

self first previous metadata

Event #	Name	Type	Created Date	
17	17@CustomerOrder-15150a316a04444aaff7dafa64b0369c	DealComplete	2016-08-23 19:20	JSON
16	16@CustomerOrder-15150a316a04444aaff7dafa64b0369c	ReadyForDeal	2016-08-23 19:20	JSON
15	15@CustomerOrder-15150a316a04444aaff7dafa64b0369c	FraudCheckPassed	2016-08-23 19:20	JSON
14	14@CustomerOrder-15150a316a04444aaff7dafa64b0369c	FraudCheckStarted	2016-08-23 19:15	JSON
13	13@CustomerOrder-15150a316a04444aaff7dafa64b0369c	DealToManual	2016-08-23 18:19	JSON
12	12@CustomerOrder-15150a316a04444aaff7dafa64b0369c	ReadyForDeal	2016-08-23 18:19	JSON
11	11@CustomerOrder-15150a316a04444aaff7dafa64b0369c	Redeal	2016-08-23 18:19	JSON
10	10@CustomerOrder-15150a316a04444aaff7dafa64b0369c	OrderItemsRejected	2016-08-23 18:19	JSON
9	9@CustomerOrder-15150a316a04444aaff7dafa64b0369c	DealOut	2016-08-23 17:51	JSON
8	8@CustomerOrder-15150a316a04444aaff7dafa64b0369c	DealToIronman	2016-08-23 17:51	JSON
7	7@CustomerOrder-15150a316a04444aaff7dafa64b0369c	CancellationWindowExceeded	2016-08-23 17:42	JSON
6	6@CustomerOrder-15150a316a04444aaff7dafa64b0369c	SecondaryFraudCheckPassed	2016-08-23 17:40	JSON



## PATIENTS

ID	NAME	AGE	WARD	IS ADMITTED
04e3b534-8a40...	Tony Ferguson	32	NULL	false

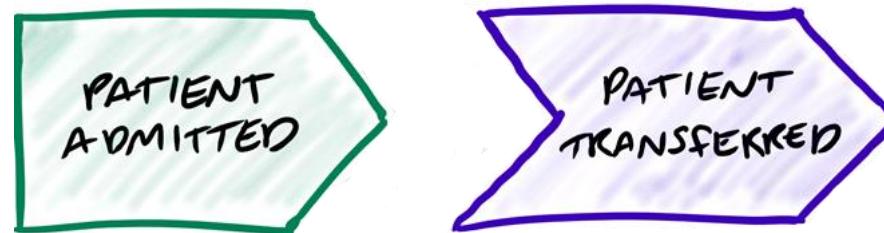
## PATIENTS AUDIT

04e3b534-8a40...	Tony Ferguson	32	34	true
04e3b534-8a40...	Tony Ferguson	32	76	true
04e3b534-8a40...	Tony Ferguson	32	10	true

ADMIT PATIENT()



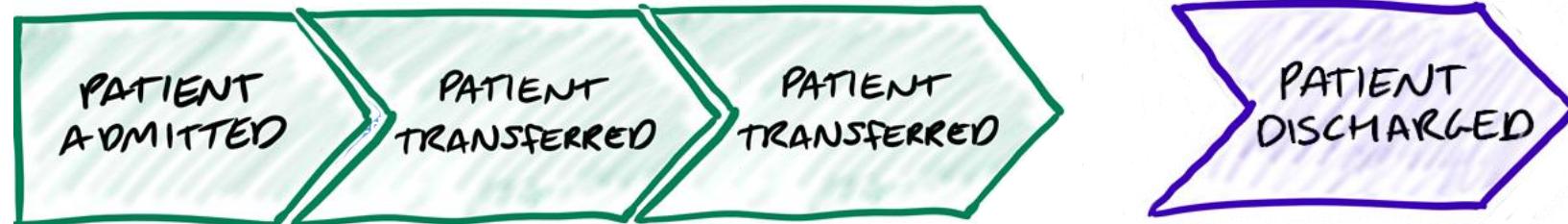
TRANSFER PATIENT()

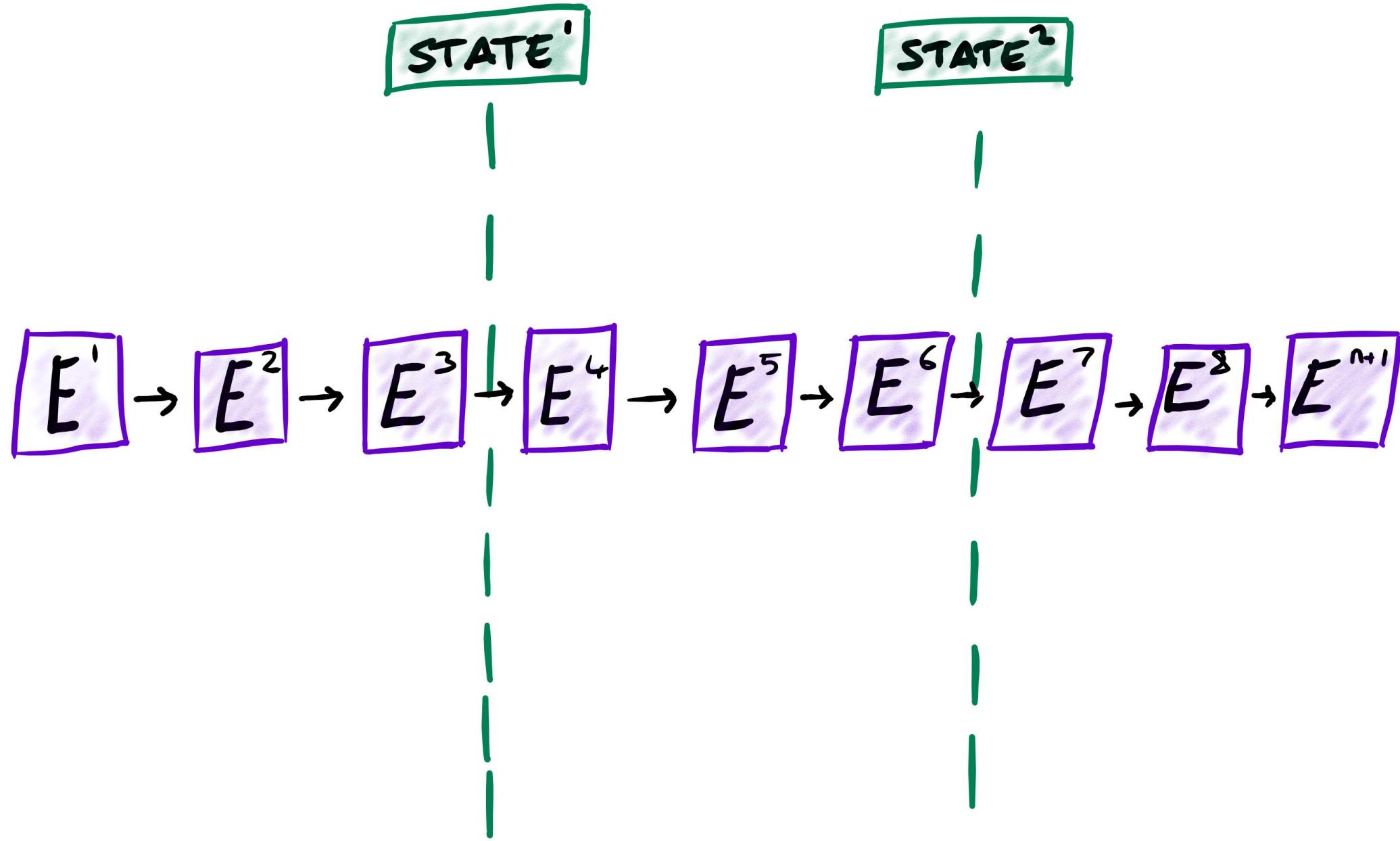


TRANSFER PATIENT()



DISCHARGE PATIENT()





CQRS

**PatientAdmitted**

**Id:** 04e3b534-8a40-41...

**Name:** Tony Ferguson

**Age:** 32

**Ward:** 10

**PatientTransferred**

**Id:** 04e3b534-8a40-41...

**ToWard:** 76

**PatientTransferred**

**Id:** 04e3b534-8a40-41...

**ToWard:** 34

**PatientDischarged**

**Id:** 04e3b534-8a4a...

**PatientAdmitted**

**Id:** 04e3b534-8a40-41...

**Name:** Tony Ferguson

**Age:** 32

**Ward:** 10

**PatientTransferred**

**Id:** 04e3b534-8a40-41...

**ToWard:** 76

**PatientTransferred**

**Id:** 04e3b534-8a40-41...

**ToWard:** 34

**PatientDischarged**

**Id:** 04e3b534-8a4a...

**INSERT**

ID	NAME	AGE	WARD
04e3b534-8a40...	Tony Ferguson	32	34

**PatientAdmitted**

**Id:** 04e3b534-8a40-41...

**Name:** Tony Ferguson

**Age:** 32

**Ward:** 10

**PatientTransferred**

**Id:** 04e3b534-8a40-41...

**ToWard:** 76

**PatientTransferred**

**Id:** 04e3b534-8a40-41...

**ToWard:** 34

**PatientDischarged**

**Id:** 04e3b534-8a4a...

**UPDATE**

ID	NAME	AGE	WARD
04e3b534-8a40...	Tony Ferguson	32	76

**PatientAdmitted**

**Id:** 04e3b534-8a40-41...

**Name:** Tony Ferguson

**Age:** 32

**Ward:** 10

**PatientTransferred**

**Id:** 04e3b534-8a40-41...

**ToWard:** 76

**PatientTransferred**

**Id:** 04e3b534-8a40-41...

**ToWard:** 34

**PatientDischarged**

**Id:** 04e3b534-8a4a...

UPDATE

ID	NAME	AGE	WARD
04e3b534-8a40...	Tony Ferguson	32	34

**PatientAdmitted**

**Id:** 04e3b534-8a40-41...

**Name:** Tony Ferguson

**Age:** 32

**Ward:** 10

**PatientTransferred**

**Id:** 04e3b534-8a40-41...

**ToWard:** 76

**PatientTransferred**

**Id:** 04e3b534-8a40-41...

**ToWard:** 34

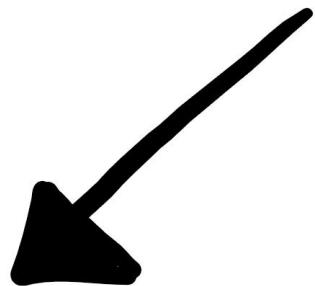
**PatientDischarged**

**Id:** 04e3b534-8a4a...

**DELETE**

ID	NAME	AGE	WARD
—	—	—	—
—	—	—	—
—	—	—	—
—	—	—	—

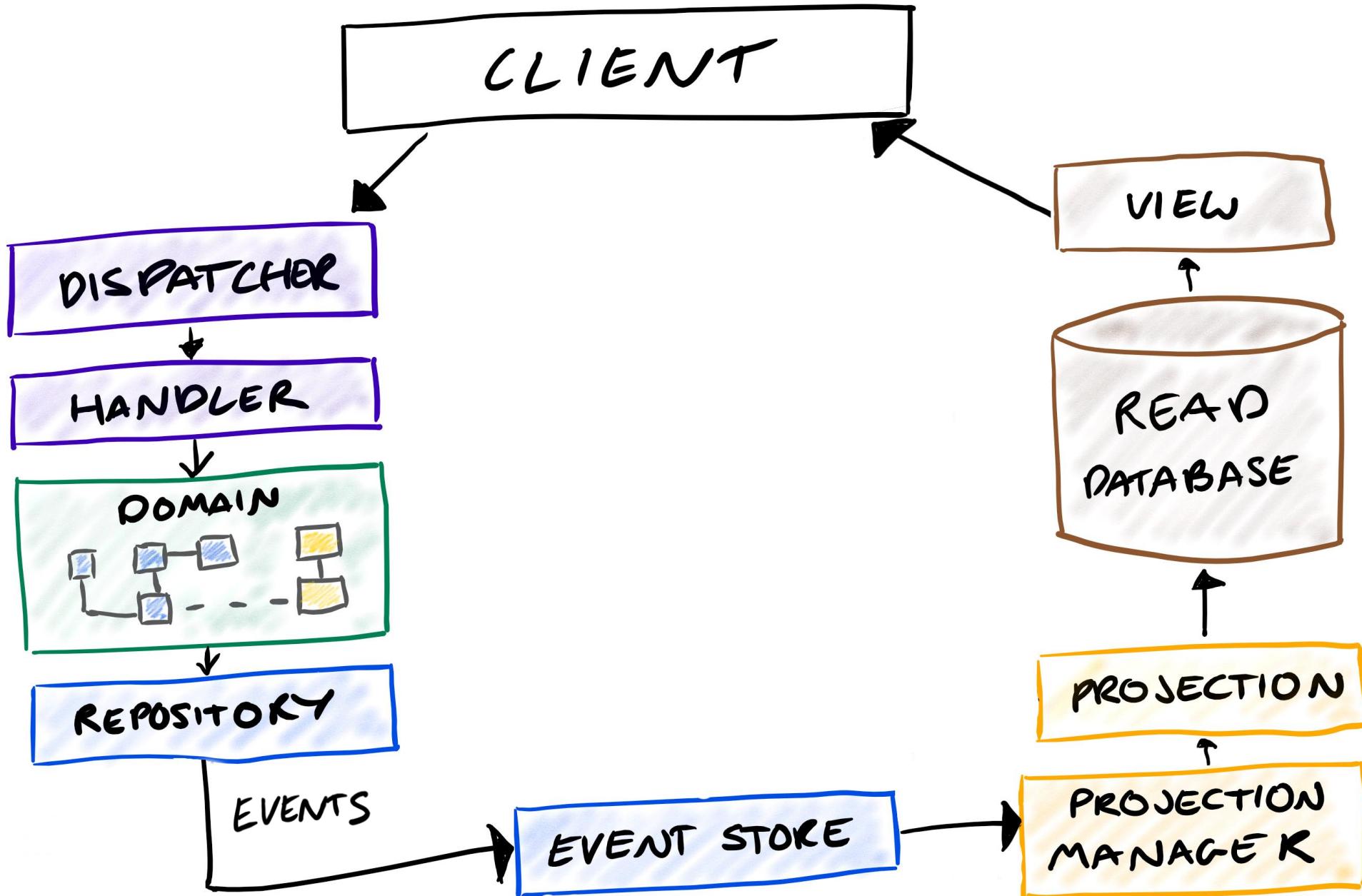
PATIENT  
ADMITTED

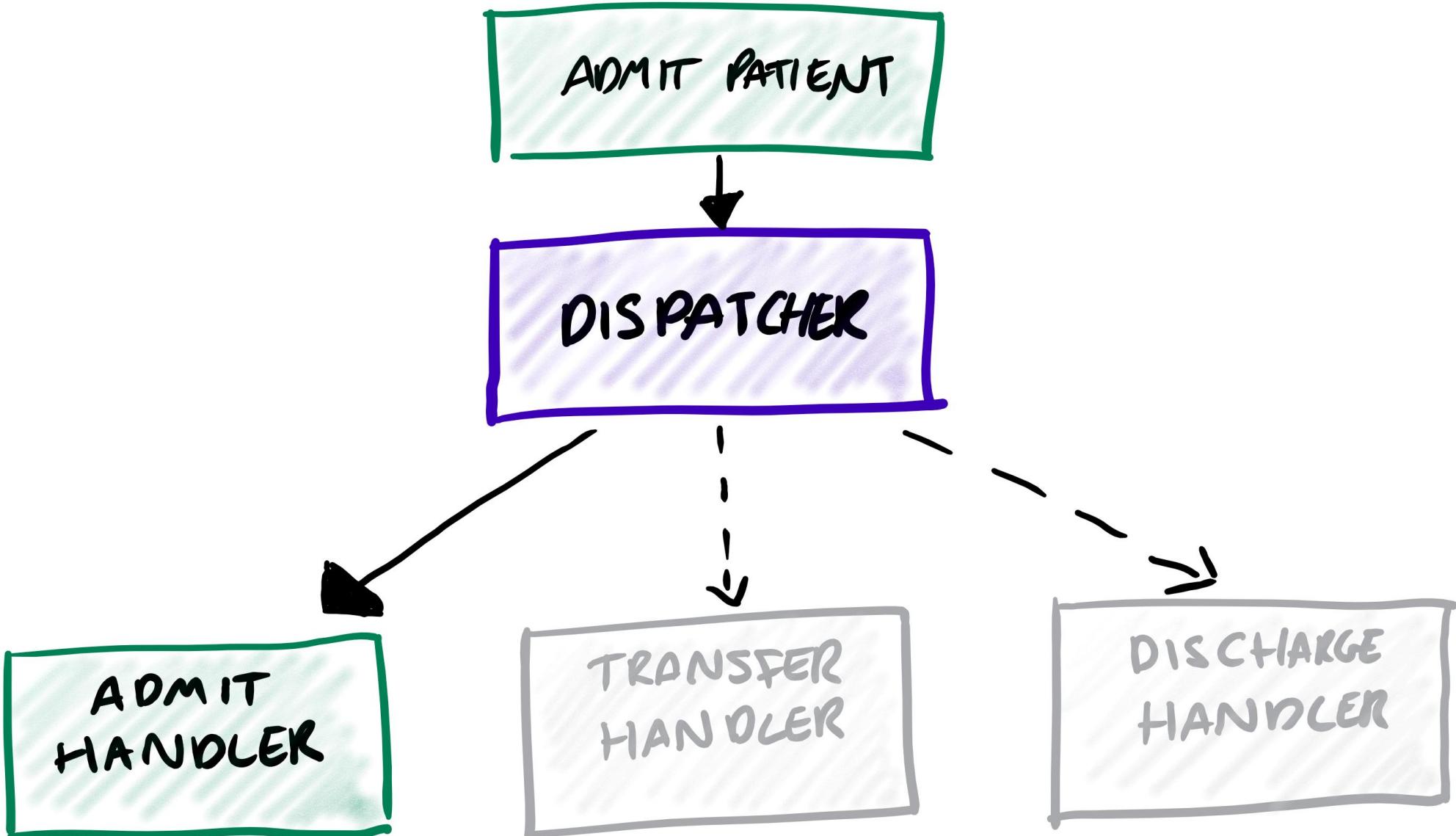


WARD VIEW		



DEMOGRAPHICS			



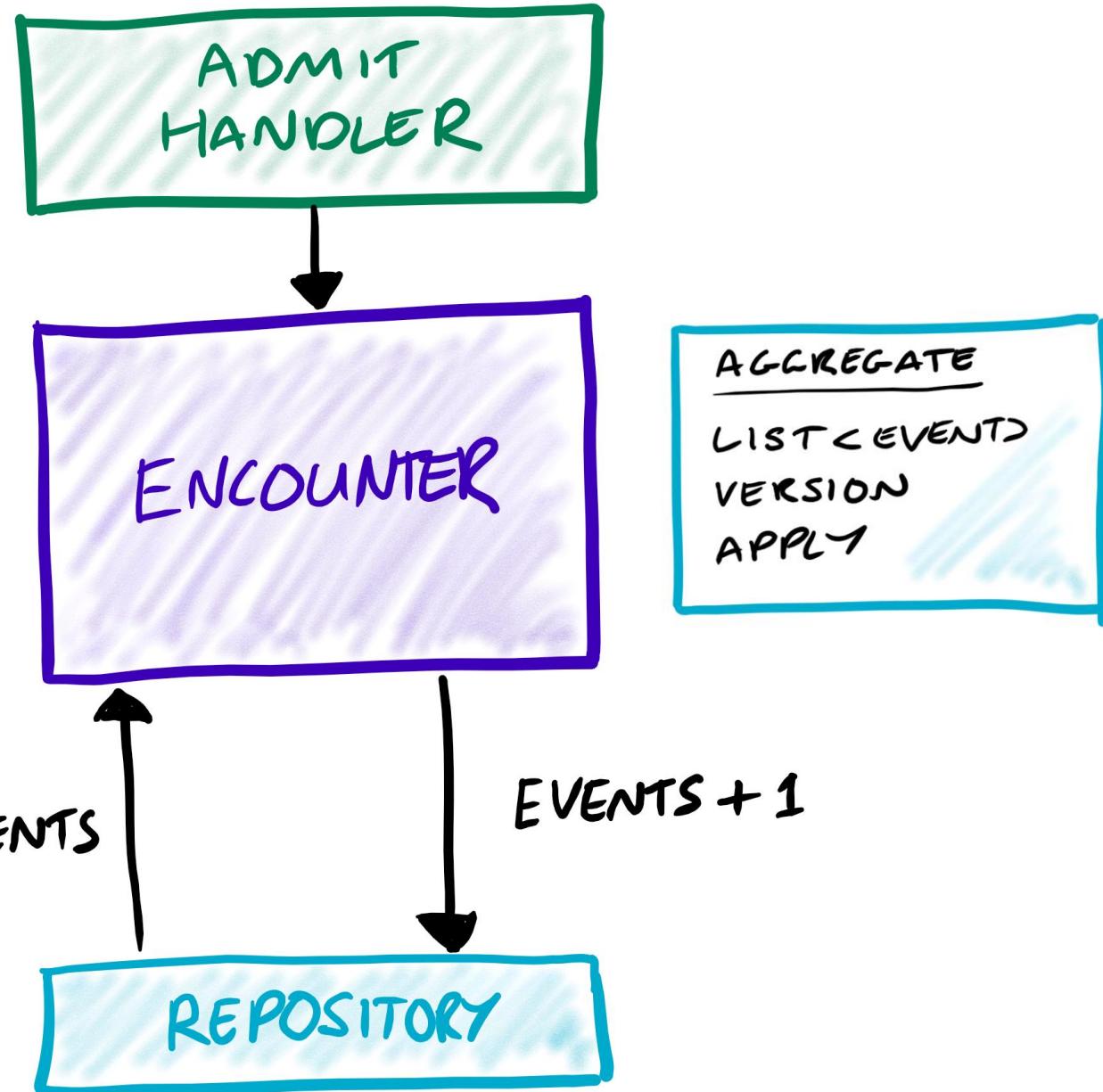


```
var admitPatient = new AdmitPatient(patientId, "Tony Ferguson", 32, DateTime.UtcNow, 10);
await dispatcher.Dispatch(admitPatient);
```

```
public Task Dispatch(object command)
{
    var handler = _map.Get(command);

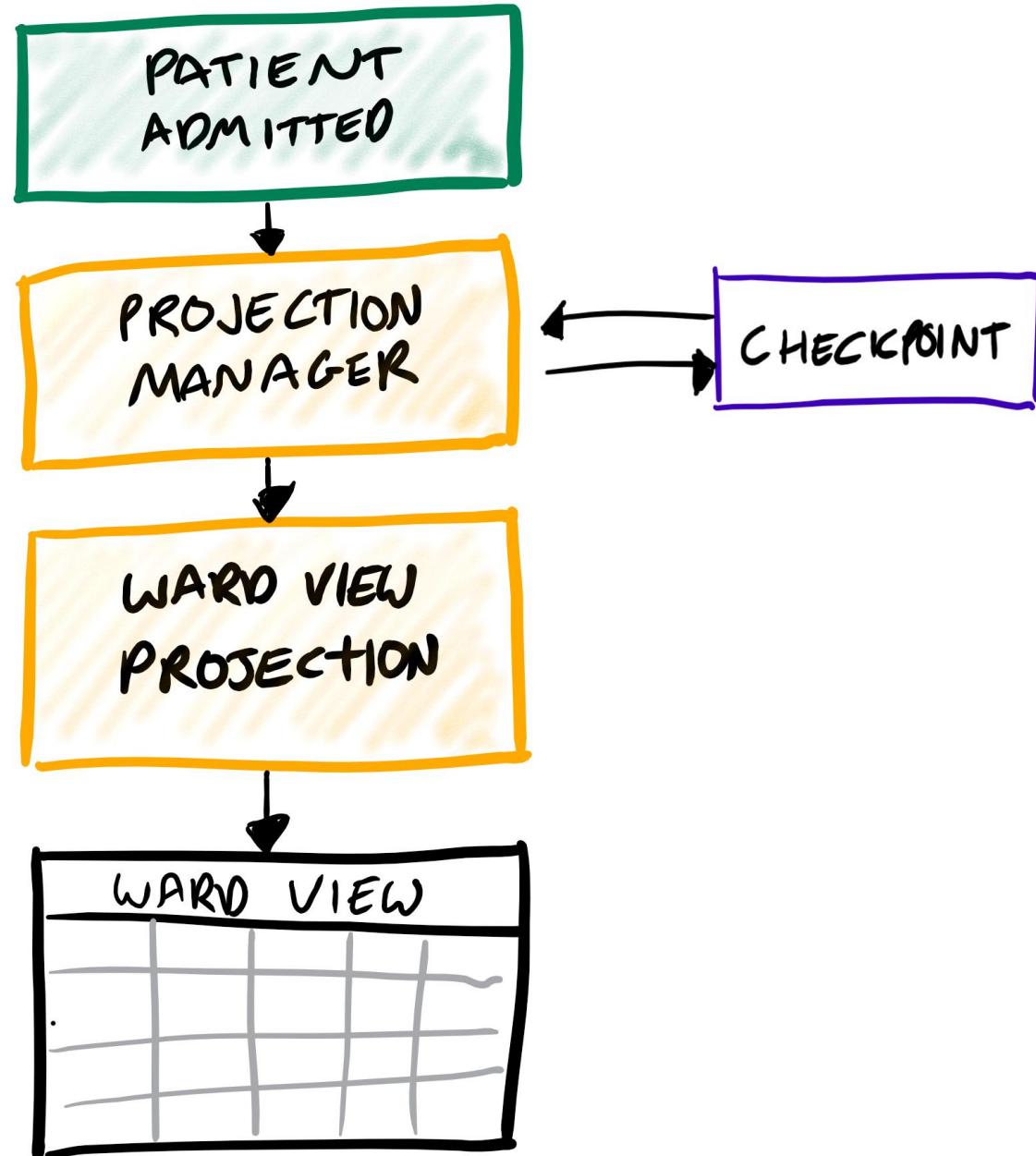
    return handler(command);
}
```

```
Register<AdmitPatient>(async c =>
{
    var encounter = new Encounter(c.PatientId, c.PatientName, c.AgeInYears, c.WardNumber);
    await repository.Save(encounter);
});
```



```
public Encounter(Guid patientId, string patientName, int ageInYears, int wardNumber)
    : this()
{
    Raise(new PatientAdmitted(patientId, patientName, ageInYears, wardNumber));
}

public void When(PatientAdmitted e)
{
    _currentlyAdmitted = true;
    Id = e.PatientId;
    _patientName = e.PatientName;
    _ageInYears = e.AgeInYears;
    _ward = e.WardNumber;
}
```



```
When<PatientAdmitted>(e =>
{
    using (var session = connectionFactory.Connect())
    {
        session.Store(new Patient
        {
            Id = e.PatientId,
            WardNumber = e.WardNumber,
            PatientName = e.PatientName,
            AgeInYears = e.AgeInYears
        });

        session.SaveChanges();
    }

    Console.WriteLine($"Recording Patient Admission: {e.PatientName}");
});
```

EVENTUAL  
CONSISTENCY

[UI]

TITLE: MR

FORENAME: TONY

SURNAME: FERGUSON

AGE : 32

WARD: 73

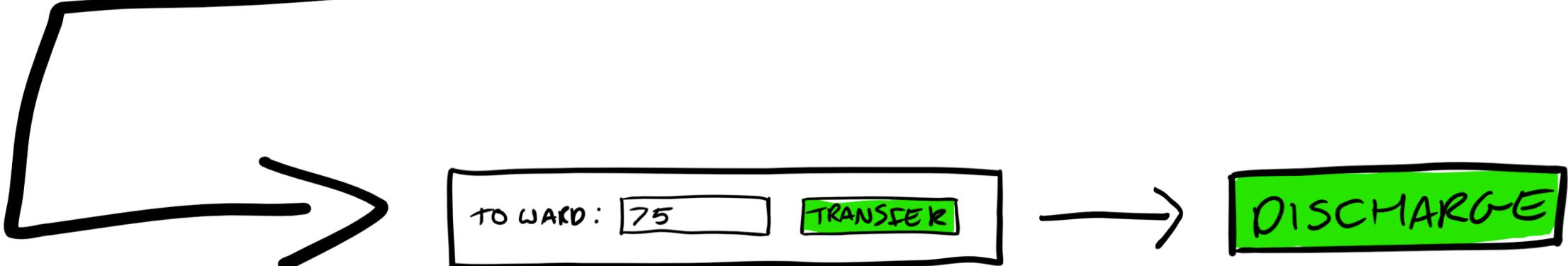
SAVE

CANCEL

TITLE:	MR
FORENAME:	TONY
SURNAME:	FERGUSON
AGE :	32
WARD:	73
ADMIT PATIENT	



TO WARD:	75	TRANSFER
----------	----	----------



TO WARD:	75	TRANSFER
----------	----	----------

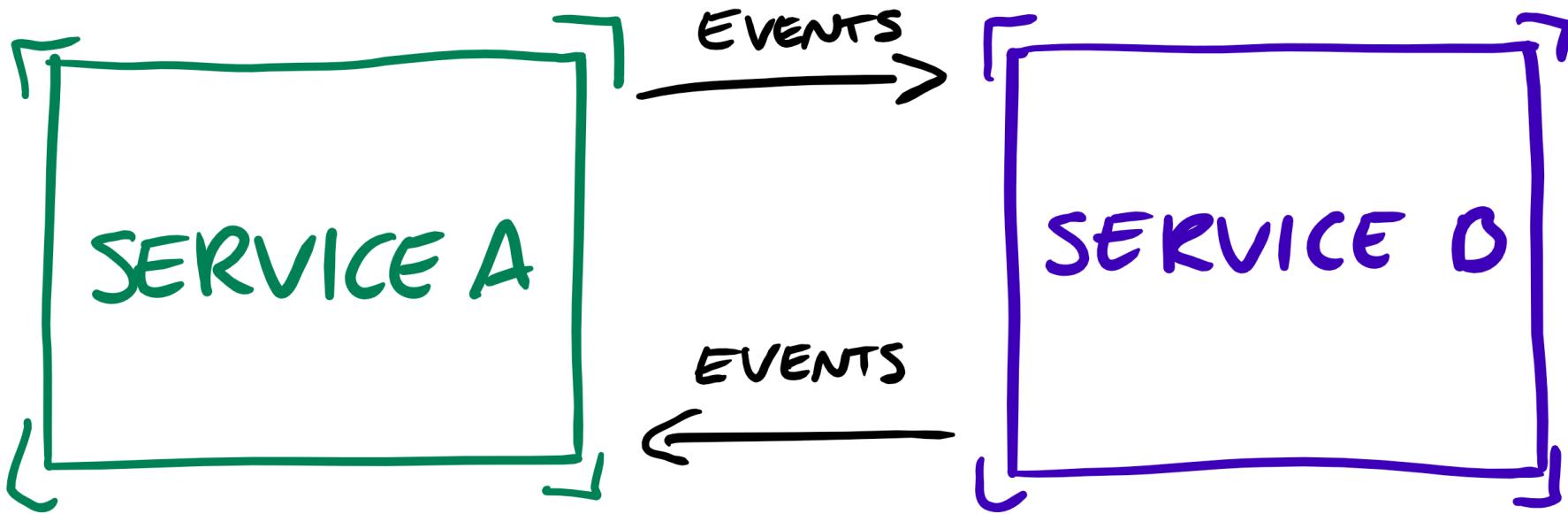
DISCHARGE

TESTING

```
var patientId = Guid.NewGuid();

new Scenario().
    Given(
        new PatientAdmitted(patientId, "Tony Ferguson", 32, 19),
        new PatientTransferred(patientId, 78),
        new PatientTransferred(patientId, 31))
    .When(new DischargePatient(patientId))
    .Then(e =>
{
    //...
})
.Assert();
```

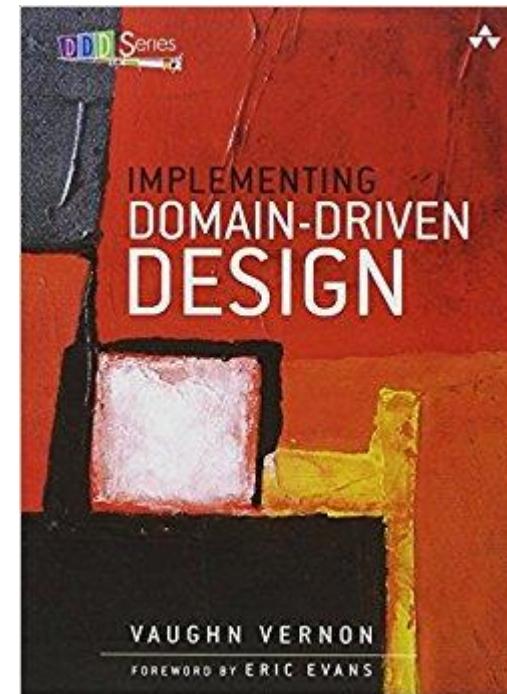
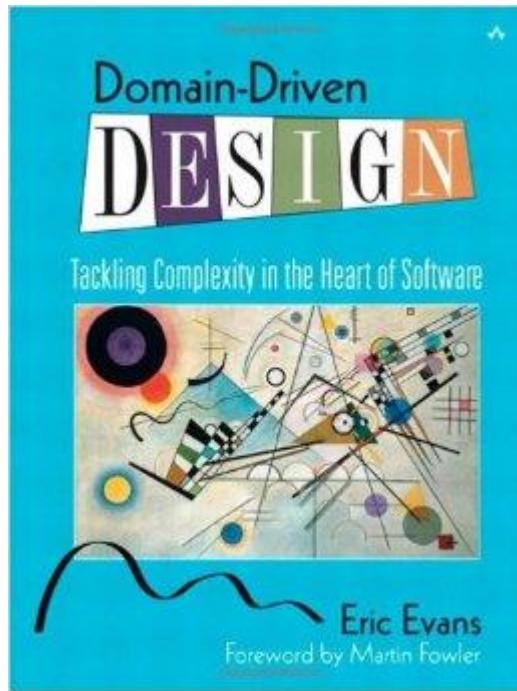
COMMUNICATION

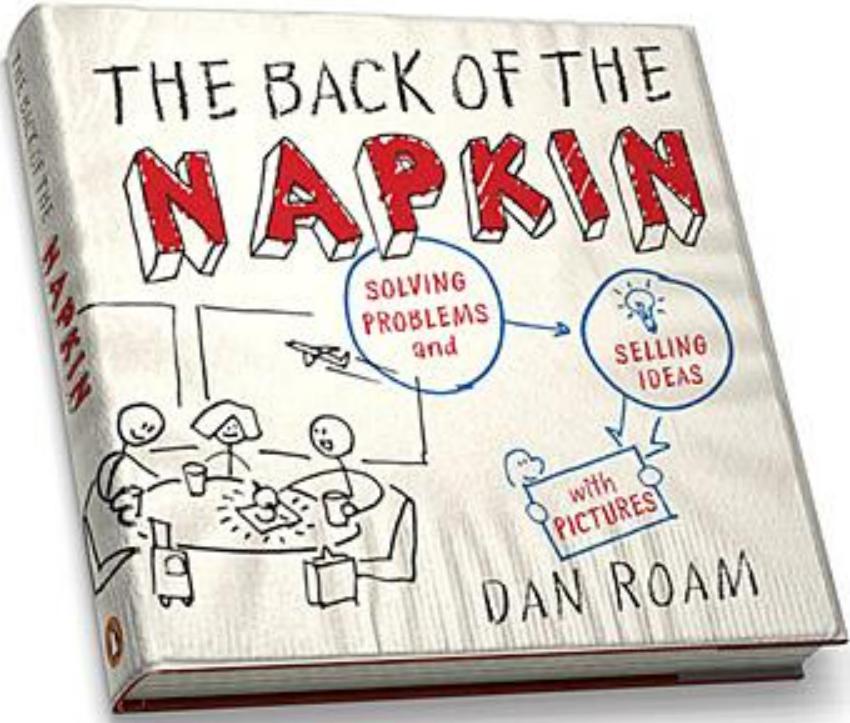


# EVENT STORMING

Alberto Brandolini







<https://github.com/mat-mcoughlin/PatientMangement>

# LINKS

- DDD-ES-CQRS Google Group  
<https://groups.google.com/forum/#!forum/dddqrs>
- DDD-ES-CQRS Slack Channel  
<http://ddd-cqrs-es.herokuapp.com/>
- Greg Young, Event Sourcing  
<https://www.youtube.com/watch?v=JHGkaShoyNs>

 mat\_mcloughlin