

Events with FHIR: a Simplified Way to Unify Health Data

Myles Bell - babylon health



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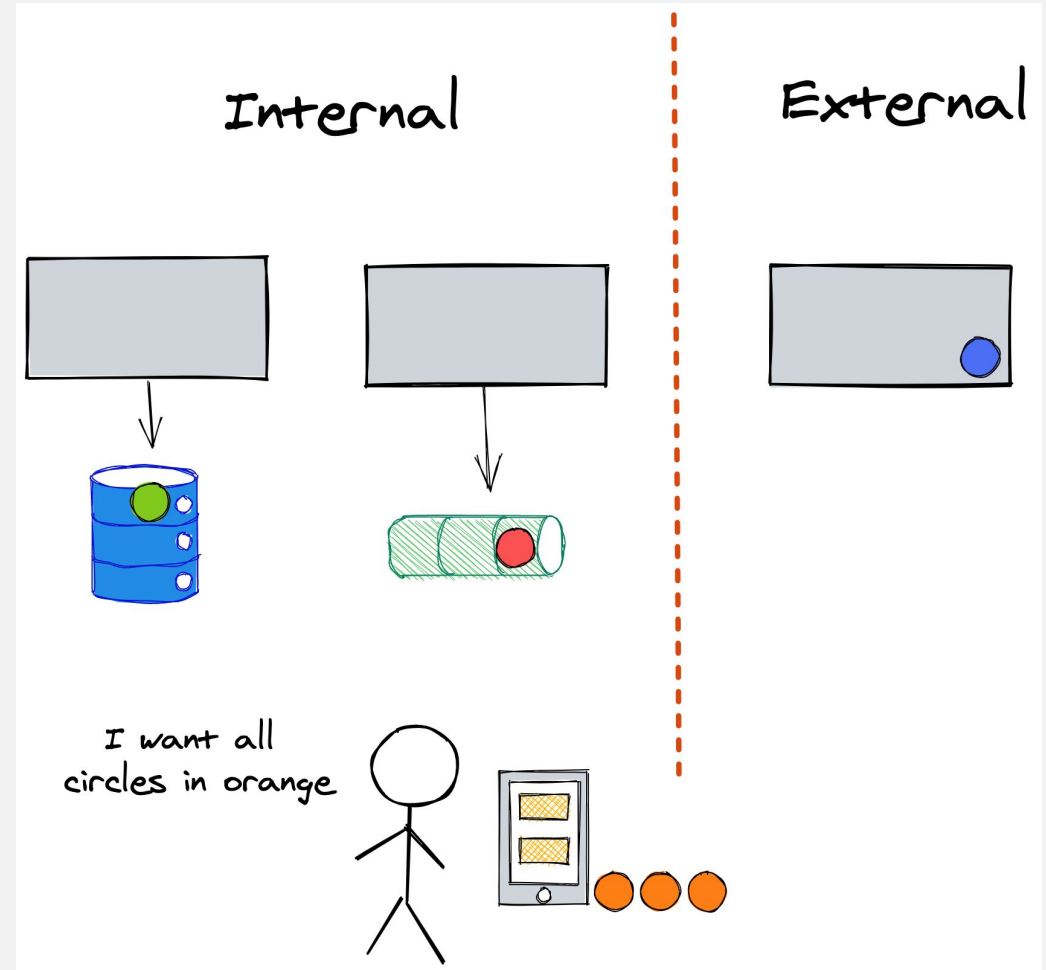
Who am I?

- Myles Bell
- Senior Software Engineer @ babylon health



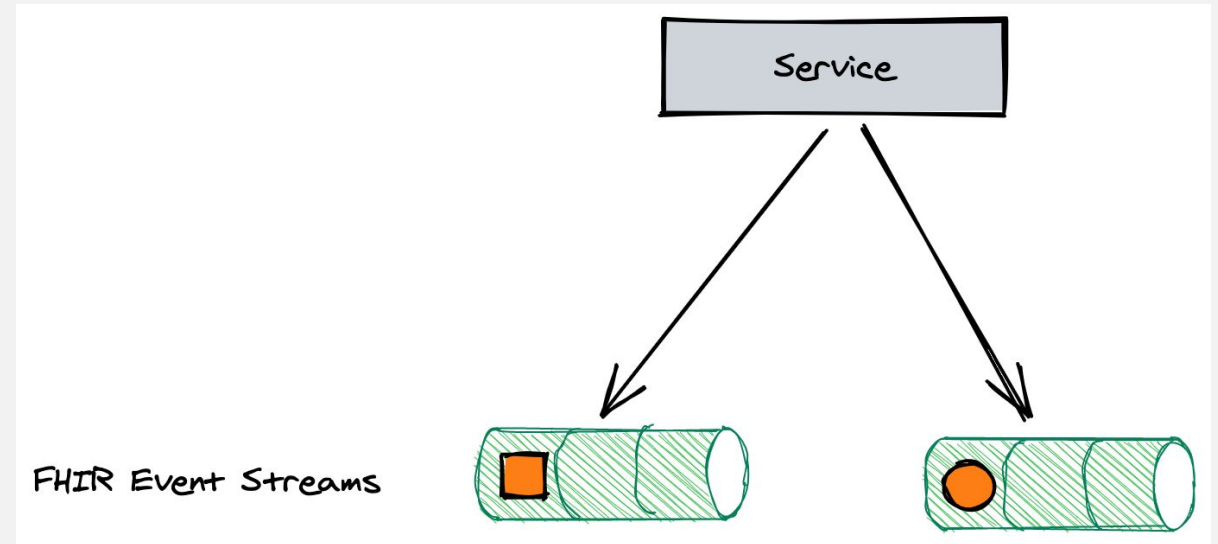
The Problem: Silos

- Aim: A complete view of data across silos
- Silos including:
 - Internal microservices
 - External healthcare ecosystem



Solution: Overview

- Create set of event streams to structure all health data
- Align the **event schemas** with FHIR
- Each event stream is owned by a **domain**

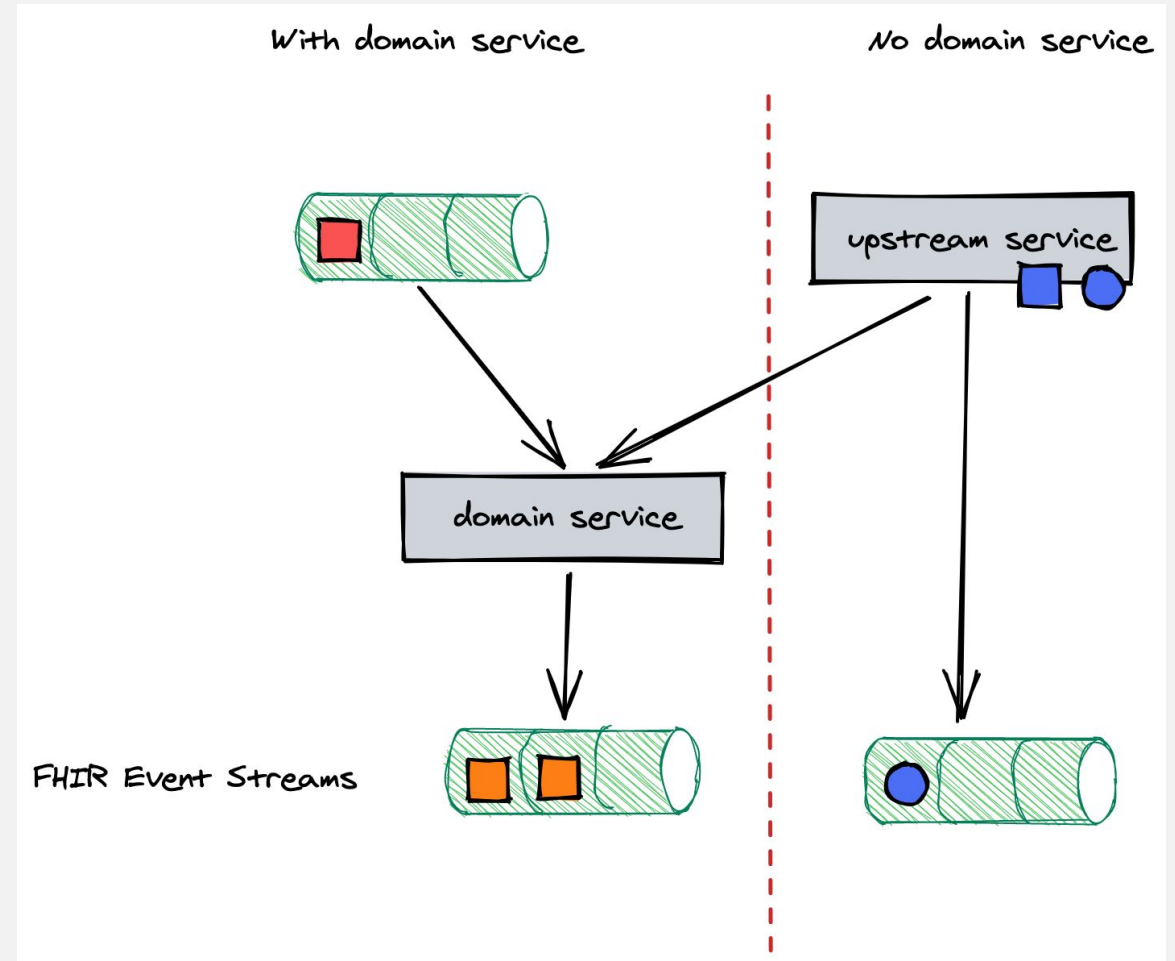


Solution: Benefits

- Services have autonomy
- Clear ownership of data
- Teams can remain specialist
- Performant and scalable
- Easy to reprocess events

Solution: Drawbacks

- Eventual consistency
- Mitigation:
 - Domain services provided read after write consistency

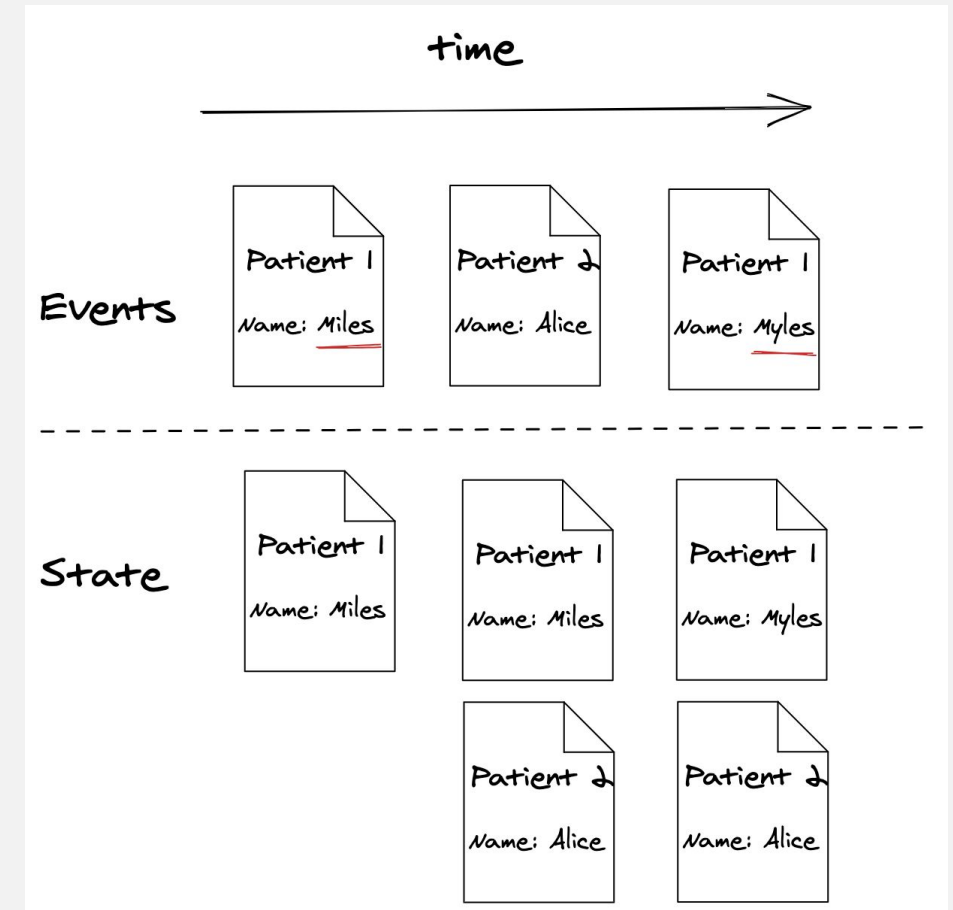


Solution: Drawbacks

- Distributed data validation
- Hard to report failures
- Existing discussion:
<https://www.hl7.org/fhir/services>

State with Events

- Every event has a business identifier for each resource instance
- Full state must be published on every event
- Create - First event with identifier
- Update - Subsequent events with identifier
- Delete - Normally update status to entered-in-error or equivalent



Event Schemas

- Schemas should help developers as many are not familiar with FHIR
 - Provide strong validation
 - Only need essential fields not boilerplate
- Schemas matching FHIR resources are:
 - Flexible but do not provide strong validation
 - Have a lot of Complex Types

Simplified schemas

- Create schemas based on FHIR profiles
 - Resource instances do not need to provide fixed fields
 - Enums for fields with ValueSet binding

Simplified Schema: Example

FHIR Profile

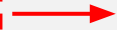
```
{
  "resourceType": "StructureDefinition",
  "baseDefinition":
    "http://hl7.org/fhir/StructureDefinition/Observation",
  "differential": {
    "element": [{
      "id": "Observation.subject",
      "min": 1,
      "path": "Observation.subject"
    },
    {
      "id": "Observation.category",
      "min": 1,
      "path": "Observation.category",
      "patternCodeableConcept": {
        "coding": [
          {
            "code": "vital-signs",
            "display": "Vital Signs",
            "system": "http://terminology.hl7.org/CodeSystem/observation-category"
          }
        ]
      }
    }
  ]
}
...
}
```

Required field

Fixed field

Simplified Event

```
{
  "id": "id1",
  "subject": "id2",
  "status": "final",
  "value": "150",
  "unit": "cm"
}
```



```
{
  "resourceType": "Observation",
  "identifier": {
    "system": "https://babylon.com/height",
    "value": "id1"
  },
  "subject": {
    "reference": "Patient/id2"
  },
  "status": "final",
  "category": {
    "coding": [
      {
        "system": "http://terminology.hl7.org/CodeSystem/observation-category",
        "code": "vital-signs",
        "display": "Vital Signs"
      }
    ]
  },
  "code": {
    "coding": [
      {
        "system": "http://snomed.info/sct",
        "code": "50373000",
        "display": "Body height measure"
      }
    ]
  },
  "valueQuantity": {
    "value": "150",
    "unit": "cm"
  }
}
```

Simplified Schemas

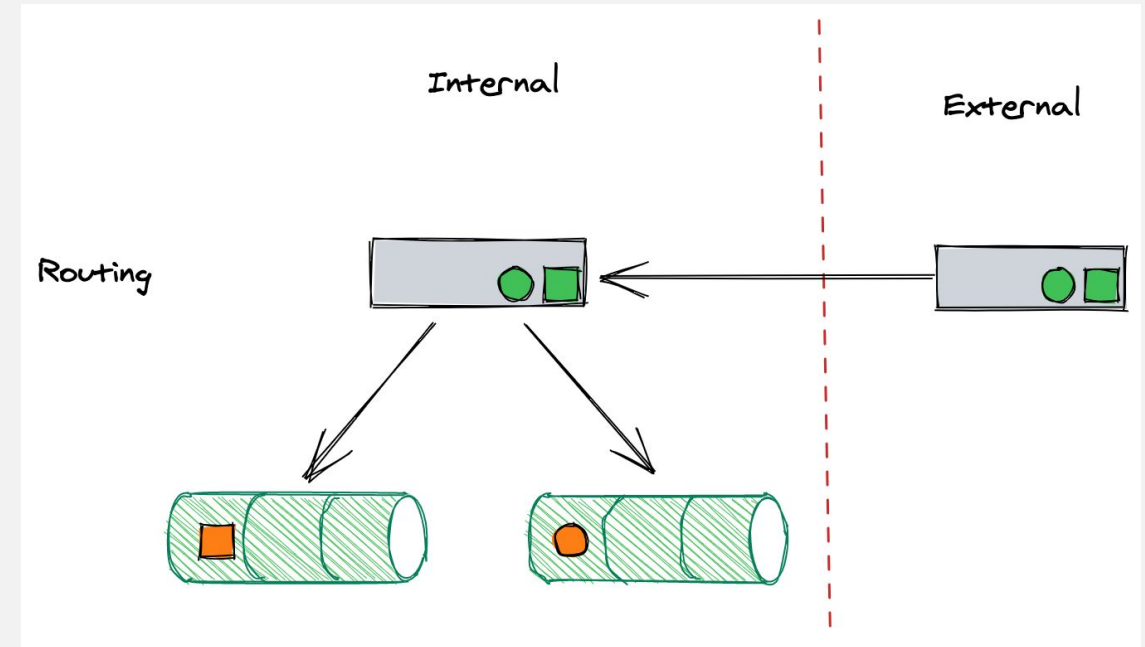
- Require:
 - Creation of desired FHIR profiles
 - Generation of schema from FHIR profile
 - A transformation from a simplified event into a FHIR event
- Other simplifications are possible:
 - Multiple FHIR profiles in one event
 - Provenance in every schema

Simplified schemas

- Pros:
 - Only requires a basic understanding of FHIR
 - Easier for developers to correctly produce data
 - Easier for the business to understand its data
- Cons:
 - Extra transformation step
 - Extra work creating and maintaining FHIR profiles

External Data

- Goal - Import data as events
- External systems are not aware of internal FHIR profiles
- Find all matched profiles, not only check claims in meta.profile field
- Use profile to route to correct event stream



Overview

- The FHIR data model has been a great guide for creating high quality schemas
- The flexibility of FHIR, especially the creation of profiles enable it to adapted easily
- Developers have found interacting with events easier than the FHIR rest api

Contact

- During DevDays, you can find / reach me here:
 - Via Whova App – Speaker’s Gallery
 - Email: myles.bell@babylonhealth.com

Q&A

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