

Maintaining Consistency while Importing Legacy Data into FHIR

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About

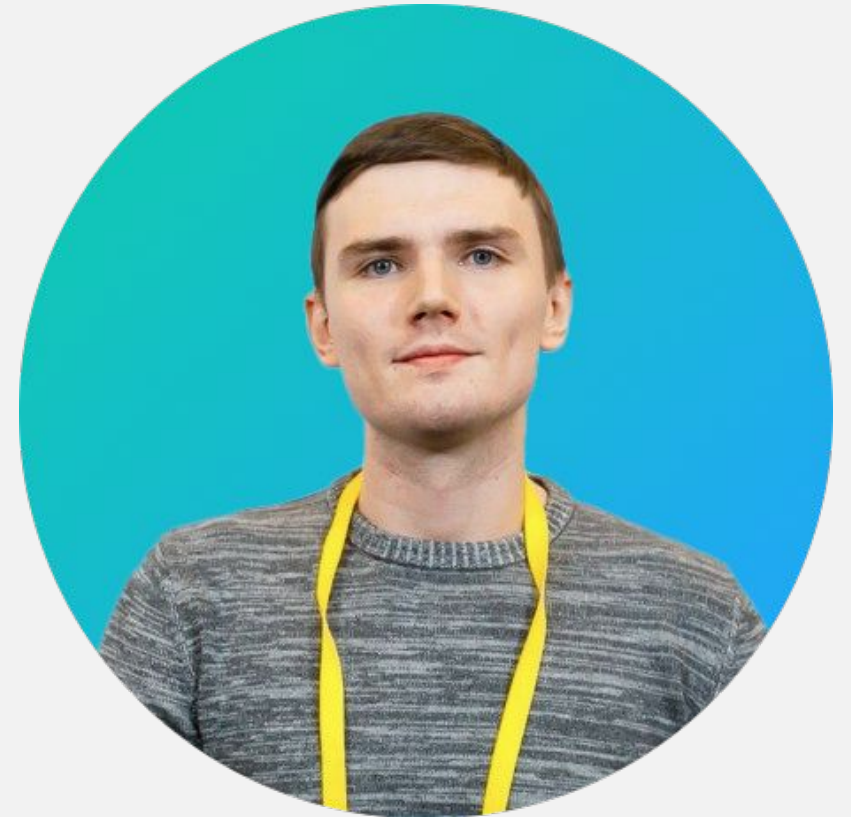
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Initial infrastructure

CRM

RIS

Intacct

PACS

Initial infrastructure

CRM

RIS

Intacct

PACS

Initial infrastructure

CRM

RIS

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PACS

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PACS

Initial infrastructure

CRM

RIS

Intacct

PACS

Initial infrastructure

CRM

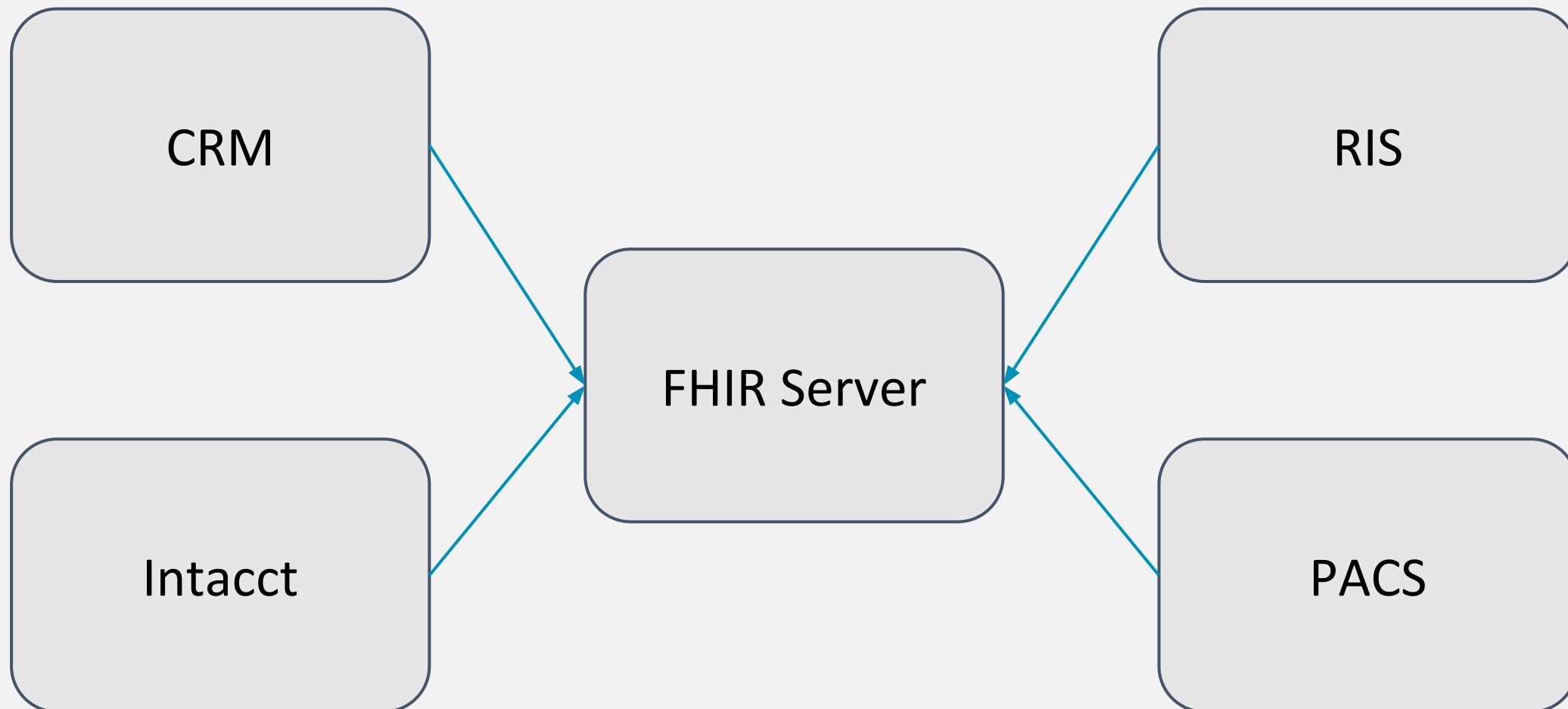
RIS

FHIR Server

Intacct

PACS

Initial infrastructure



Problems

1. Non-FHIR structure

Problems

1. Non-FHIR structure
2. Relations between resources

Problems

1. Non-FHIR structure
2. Relations between resources
3. Inconsistency

Problems

1. **Non-FHIR structure**
2. Relations between resources
3. Inconsistency

Import infrastructure



Source data: Practitioner table

first_name	last_name	NPI	organization_id
John	Smith	000000000	ORG-1
John	Smith	000000000	ORG-2
Bob	Miller	000000001	ORG-1

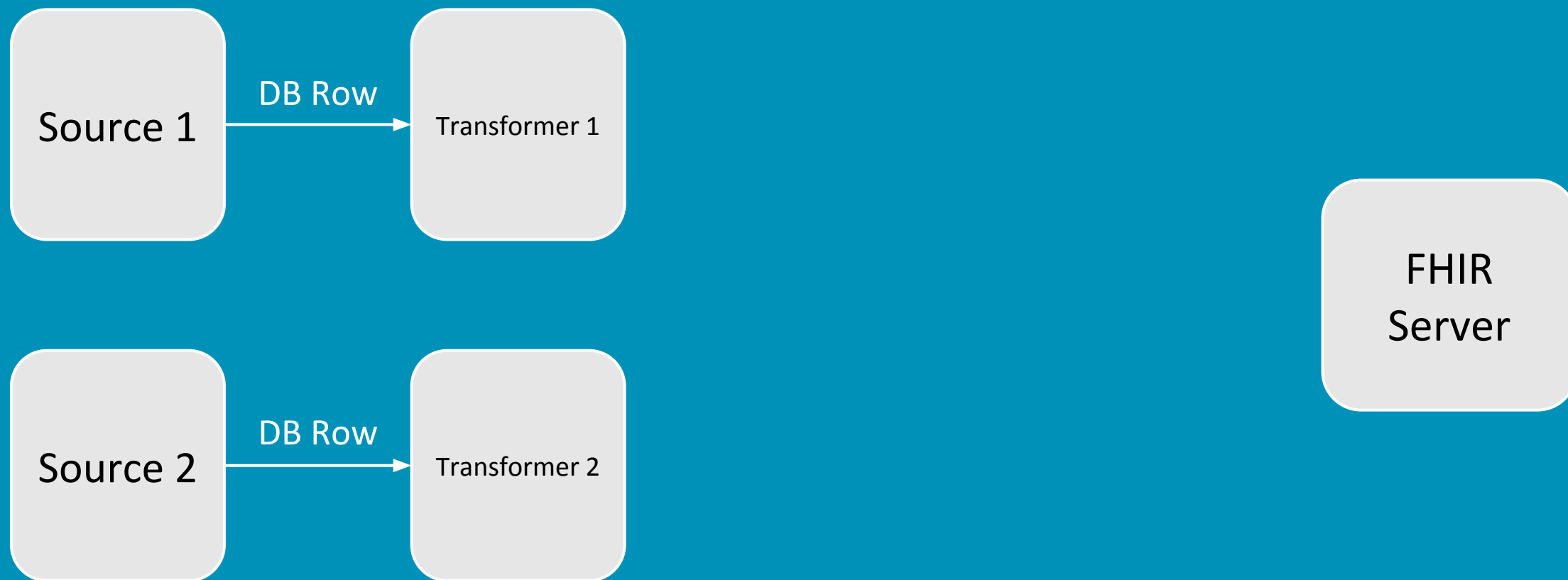
Source data: Organization table

name	organization_id	parent_organization
South Texas Radiology	ORG-1	Texas Radiology
East Imaging	ORG-2	Imaging

Import infrastructure



Import infrastructure



JUTE — mapping language

- Variables substitution
- Cycles
- Conditions
- Data transformation

<https://github.com/HealthSamurai/jute.clj>

Practitioner template

```
resourceType: Practitioner
name:
  given:
    - $ first_name
  family: $ last_name
identifier:
  - system: urn:app:npi
    value: $ npi
```

Organization template

```
resourceType: Organization
name: $ name
identifier:
  - system: urn:app:org-id
    value: $ organization_id
```

Problems

1. **Non-FHIR structure**
2. Relations between resources
3. Inconsistency

Problems

- ~~1. Non-FHIR structure~~
2. Relations between resources
3. Inconsistency

Problems

- ~~1. Non-FHIR structure~~
- 2. Relations between resources**
3. Inconsistency

References

Logical

```
referenceField:  
  identifier:  
    system: urn:app:npi  
  value: $ npi
```

Literal

```
referenceField:  
  reference: Resource/id
```

References

Logical

```
referenceField:  
  identifier:  
    system: urn:app:npi  
  value: $ npi
```

Literal

```
referenceField:  
  reference: Resource/id
```

References

Logical

```
referenceField:  
  identifier:  
    system: urn:app:npi  
  value: $ npi
```

Literal

```
referenceField:  
  reference: Resource/id
```

PractitionerRole template

```
resourceType: PractitionerRole
practitioner:
  identifier:
    system: urn:app:npi
    value: $ npi
organization:
  identifier:
    system: urn:app:org-id
    value: $ organization_id
```

PractitionerRole template

```
resourceType: PractitionerRole
practitioner:
  identifier:
    system: urn:app:npi
    value: $ npi
organization:
  identifier:
    system: urn:app:org-id
    value: $ organization_id
```

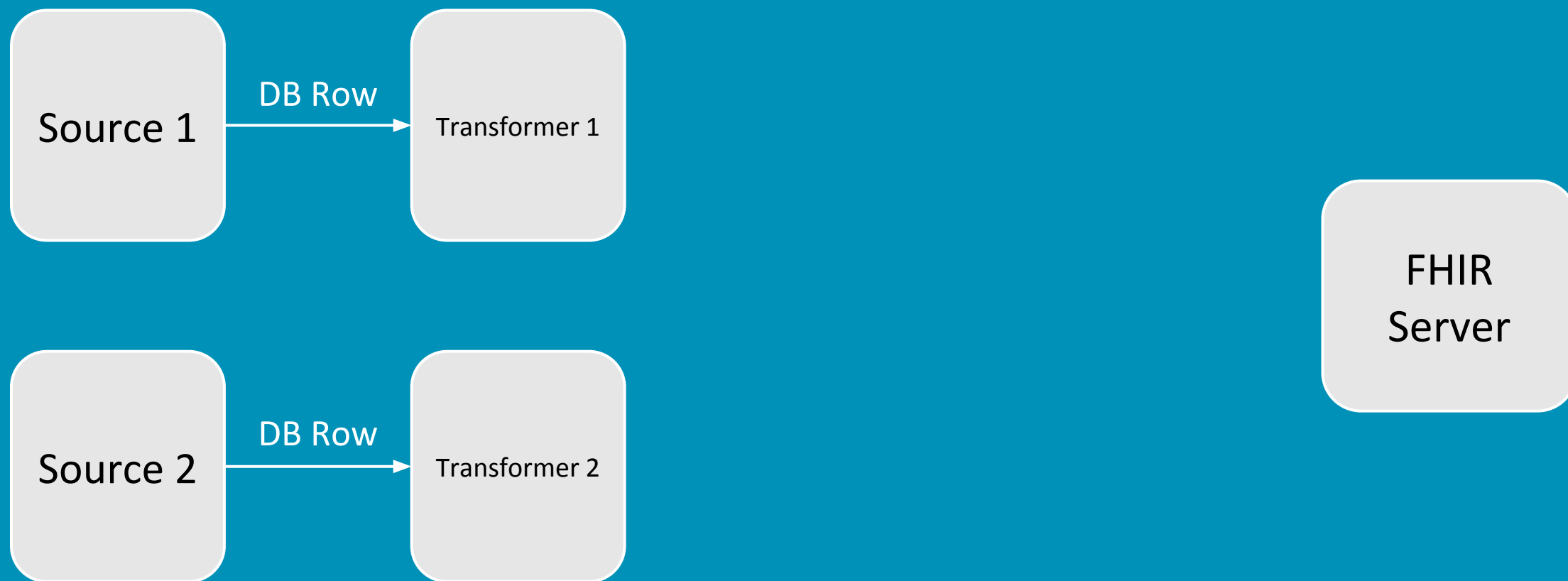
Problems

- ~~1. Non-FHIR structure~~
- 2. Relations between resources**
3. Inconsistency

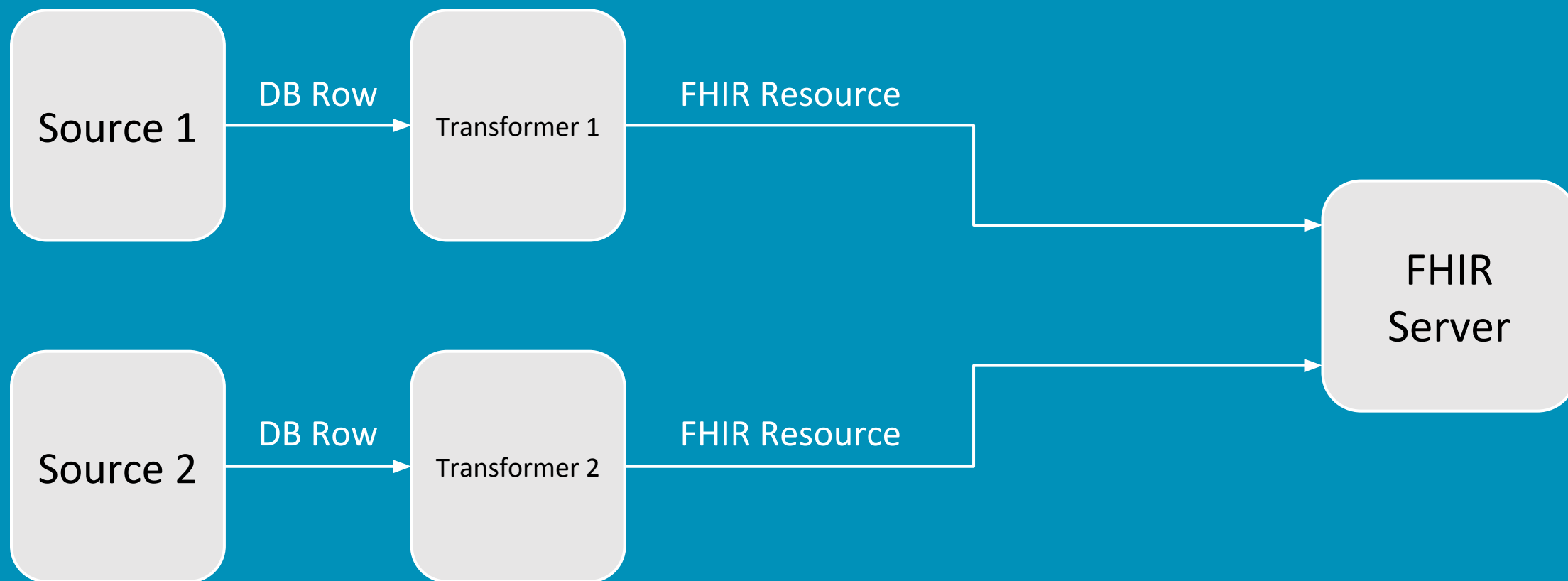
Problems

- ~~1. Non-FHIR structure~~
- ~~2. Relations between resources~~
3. Inconsistency

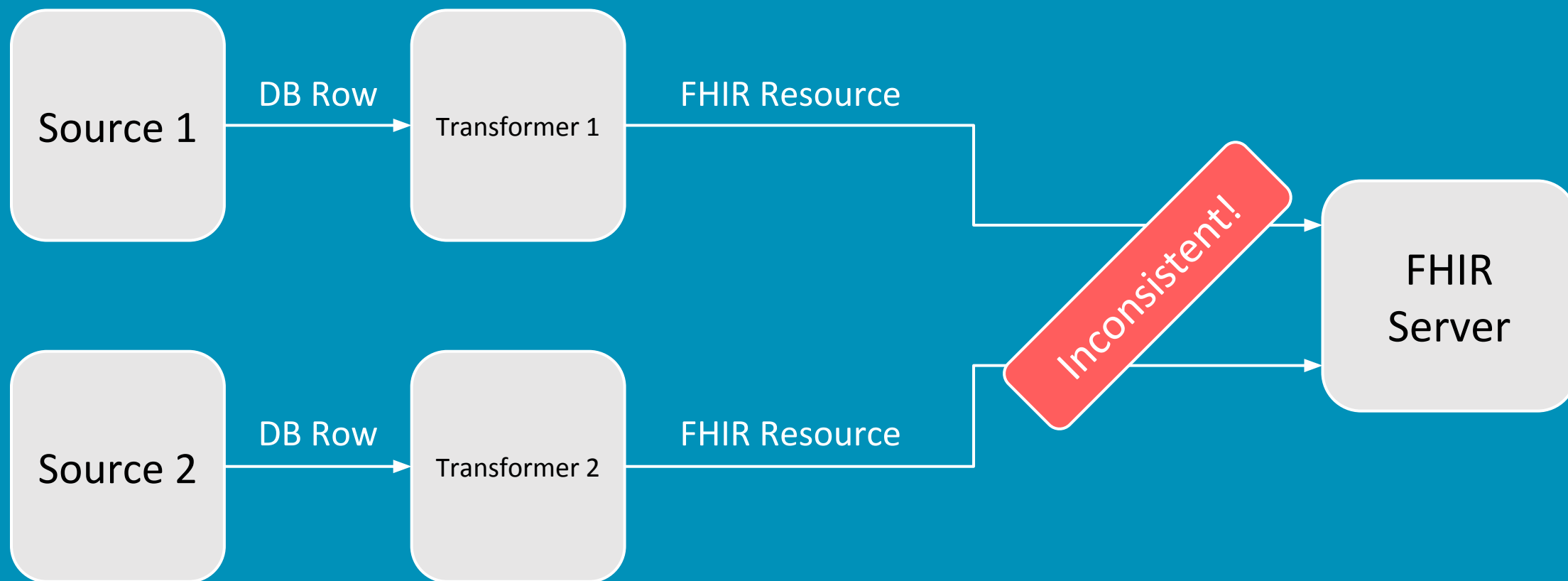
Import infrastructure



Import infrastructure



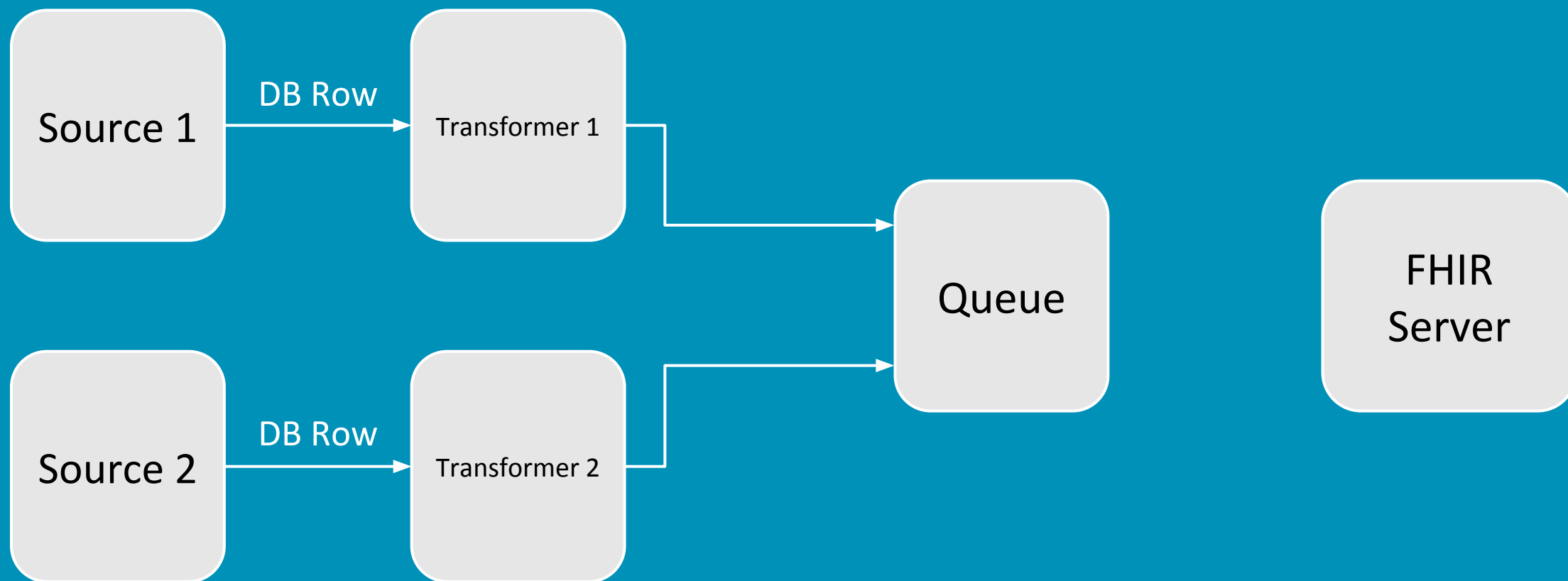
Import infrastructure



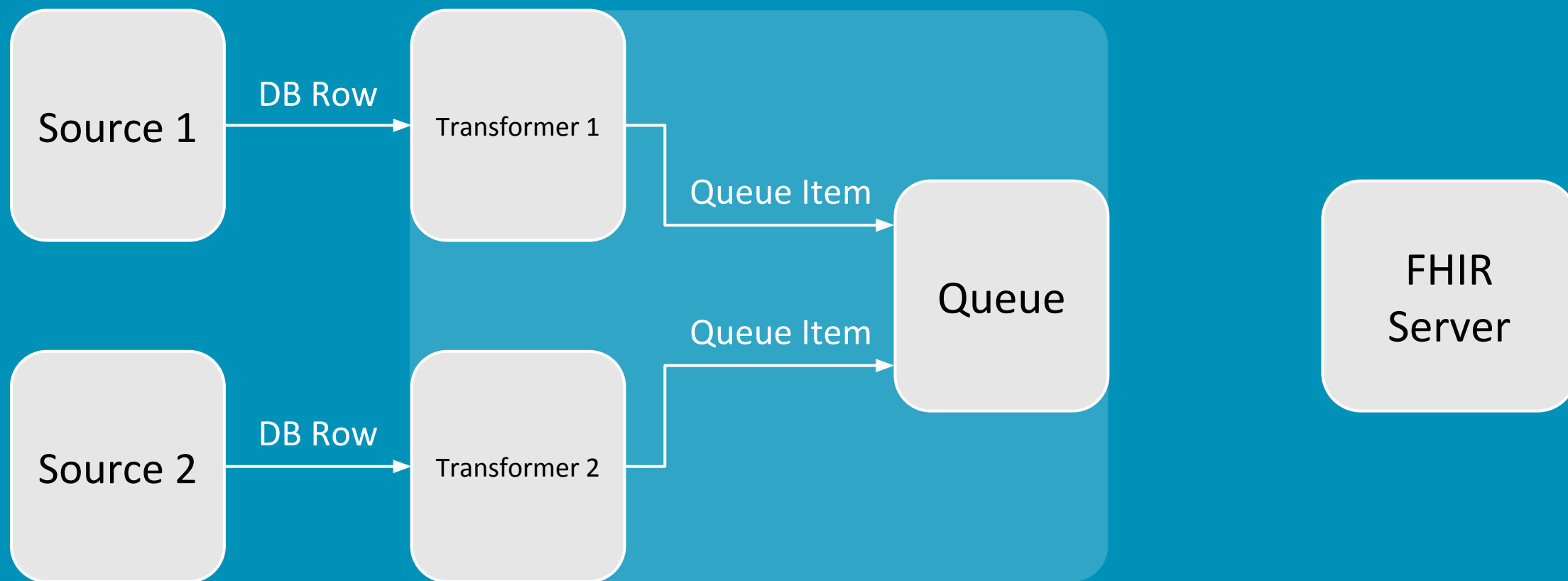
Problems

- ~~1. Non-FHIR structure~~
- ~~2. Relations between resources~~
- 3. Inconsistency**

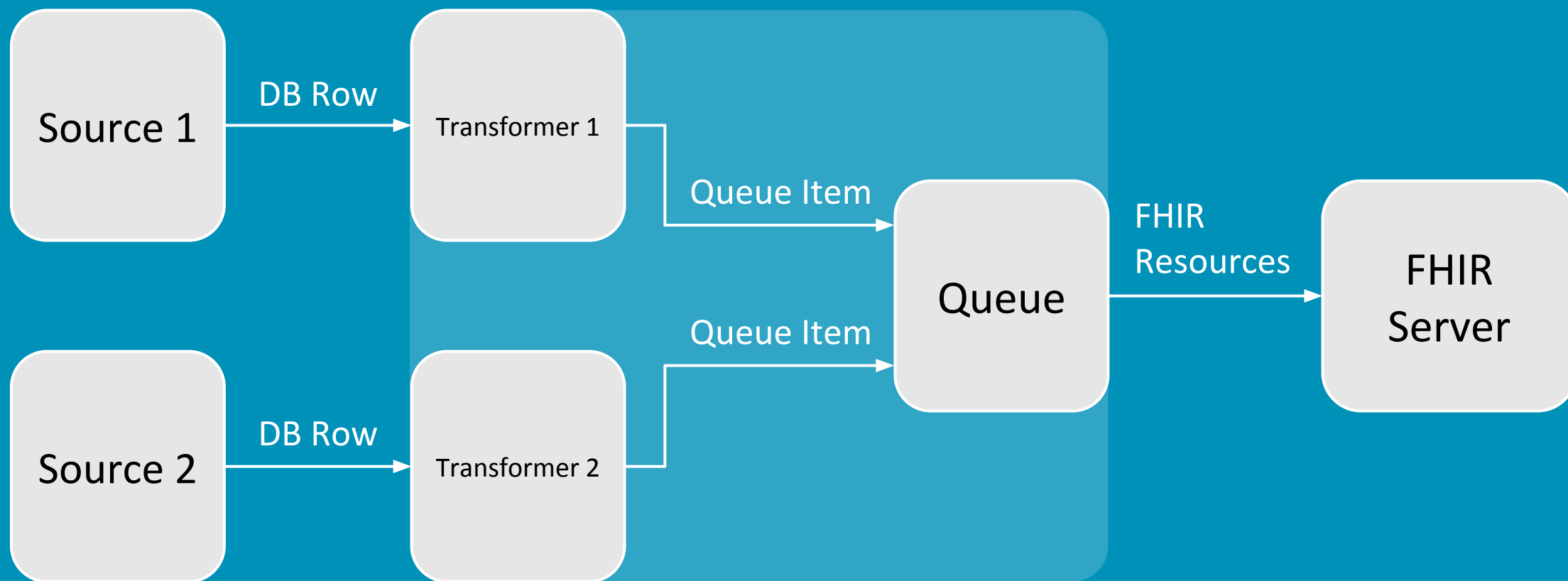
Import infrastructure



Import infrastructure



Import infrastructure



Queue Item

```
status: pending
payload:
  resourceType: Practitioner
  name: ...
  ...
```


Queue lifecycle

Practitioner
pending

Organization
pending

PractitionerRole
pending

Queue lifecycle

Practitioner
pending

Organization
pending

PractitionerRole
pending

Queue lifecycle

Practitioner
pending

Organization
pending

PractitionerRole
pending

Resolving

```
resourceType: Practitioner
```

```
name:
```

```
  given:
```

```
    - John
```

```
  family: Smith
```

```
identifier:
```

```
  - system: urn:app:npi
```

```
    value: "000000000"
```

Resolving

`resourceType`: Practitioner

`name`:

`given`:

- John

`family`: Smith

`identifier`:

- `system`: urn:app:npi

`value`: "000000000"

No relations

Applying

```
resourceType: Practitioner
```

```
name:
```

```
  given:
```

```
    - John
```

```
  family: Smith
```

```
identifier:
```

```
  - system: urn:app:npi
```

```
    value: "000000000"
```

Applying

`resourceType`: Practitioner

`name`:

`given`:

- John

`family`: Smith

`identifier`:

- `system`: urn:app:npi

`value`: "000000000"



Create

Applying

```
resourceType: Practitioner
name:
  given:
    - John
  family: Smith
identifier:
  - system: urn:app:npi
    value: "000000000"
```



Create

```
resourceType: Practitioner
id: p-1
name:
  given:
    - John
  family: Smith
identifier:
  - system: urn:app:npi
    value: "000000000"
```


Queue lifecycle

Practitioner
pending

Organization
pending

PractitionerRole
pending

Queue lifecycle

Practitioner
synced

Organization
pending

PractitionerRole
pending

Queue lifecycle

Practitioner
synced

Organization
pending

PractitionerRole
pending

Resolving

```
resourceType: Organization
name: South Texas Radiology
identifier:
  - system: urn:app:org-id
    value: ORG-1
partOf:
  extension:
    - url: urn:app:org-title
      value: Texas radiology
```

Resolving

```
resourceType: Organization
name: South Texas Radiology
identifier:
  - system: urn:app:org-id
    value: ORG-1
partOf:
  extension:
    - url: urn:app:org-title
      value: Texas radiology
```

Queue lifecycle

Practitioner
synced

Organization
pending

PractitionerRole
pending

Queue lifecycle

Practitioner
synced

Organization
manual

PractitionerRole
pending

Queue lifecycle

Practitioner
synced

Organization
manual

PractitionerRole
pending

Resolving

```
resourceType: PractitionerRole
```

```
practitioner:
```

```
  identifier:
```

```
    system: urn:app:npi
```

```
    value: "000000000"
```

```
organization:
```

```
  identifier:
```

```
    - system: urn:app:org-id
```

```
      value: ORG-1
```

Resolving

resourceType: PractitionerRole

practitioner:

identifier:

system: urn:app:npi

value: “000000000”

organization:

identifier:

- **system:** urn:app:org-id

value: ORG-1

Resolving

resourceType: PractitionerRole

practitioner:

identifier:

system: urn:app:npi

value: "000000000"

organization:

identifier:

- **system:** urn:app:org-id

value: ORG-1

1 match

resourceType: PractitionerRole

practitioner:

reference: Practitioner/p-1

organization:

identifier:

- **system:** urn:app:org-id

value: ORG-1

Resolving

```
resourceType: PractitionerRole
practitioner:
  identifier:
    system: urn:app:npi
    value: "000000000"
organization:
  identifier:
    - system: urn:app:org-id
      value: ORG-1
```

```
resourceType: PractitionerRole
practitioner:
  reference: Practitioner/p-1
organization:
  identifier:
    - system: urn:app:org-id
      value: ORG-1
```

Resolving

```

resourceType: PractitionerRole
practitioner:
  identifier:
    system: urn:app:npi
    value: "000000000"
organization:
  identifier:
    - system: urn:app:org-id
      value: ORG-1

```

0 matches

```

resourceType: PractitionerRole
practitioner:
  reference: Practitioner/p-1
organization:
  identifier:
    - system: urn:app:org-id
      value: ORG-1

```

Queue lifecycle

Practitioner
synced

Organization
manual

PractitionerRole
pending

Queue lifecycle

Practitioner
synced

Organization
manual

PractitionerRole
skipped

Queue lifecycle

Practitioner
synced

Organization
manual

PractitionerRole
skipped

Queue lifecycle

Practitioner
synced

Organization
manual

PractitionerRole
skipped

Queue lifecycle

Practitioner
synced

Organization
manual

PractitionerRole
skipped

Manual resolving

```
resourceType: Organization
name: South Texas Radiology
identifier:
  - system: urn:app:org-id
    value: ORG-1
partOf:
  extension:
    - url: urn:app:org-title
      value: Texas radiology
```

Manual resolving

resourceType: Organization

name: South Texas Radiology

identifier:

- **system:** urn:app:org-id

- value:** ORG-1

partOf:

extension:

- **url:** urn:app:org-title

- value:** Texas radiology

Manual resolving

resourceType: Organization

name: South Texas Radiology

identifier:

- **system:** urn:app:org-id

value: ORG-1

partOf:

extension:

Manual choose

- **url:** urn:app:org-title

value: Texas radiology

Manual resolving

```
resourceType: Organization
name: South Texas Radiology
identifier:
  - system: urn:app:org-id
    value: ORG-1
```

partOf:

extension:

Manual choose

- **url:** urn:app:org-title
- value:** Texas radiology

```
resourceType: Organization
name: South Texas Radiology
identifier:
  - system: urn:app:org-id
    value: ORG-1
```

partOf:

reference: Organization/o-100

Applying

```
resourceType: Organization
name: South Texas Radiology
identifier:
  - system: urn:app:org-id
    value: ORG-1
partOf:
  reference: Organization/o-100
```

Applying

```
resourceType: Organization
name: South Texas Radiology
identifier:
  - system: urn:app:org-id
    value: ORG-1
partOf:
  reference: Organization/o-100
```



Create

Applying

```
resourceType: Organization
name: South Texas Radiology
identifier:
  - system: urn:app:org-id
    value: ORG-1
partOf:
  reference: Organization/o-100
```



```
resourceType: Organization
id: o-1
name: South Texas Radiology
identifier:
  - system: urn:app:org-id
    value: ORG-1
partOf:
  reference: Organization/o-100
```

Queue lifecycle

Practitioner
synced

Organization
manual

PractitionerRole
skipped

Queue lifecycle

Practitioner
synced

Organization
synced

PractitionerRole
skipped

Queue lifecycle

Practitioner
synced

Organization
synced

PractitionerRole
skipped

Queue lifecycle

Practitioner
synced

Organization
synced

PractitionerRole
skipped

Queue lifecycle

Practitioner
synced

Organization
synced

PractitionerRole
skipped

Resolving

```
resourceType: PractitionerRole
practitioner:
  reference: Practitioner/p-1
organization:
  identifier:
    - system: urn:app:org-id
      value: ORG-1
```

Resolving

```
resourceType: PractitionerRole
practitioner:
  reference: Practitioner/p-1
organization:
  identifier:
    - system: urn:app:org-id
      value: ORG-1
```


Resolving

```
resourceType: PractitionerRole
practitioner:
  reference: Practitioner/p-1
organization:
  identifier:
    - system: urn:app:org-id
      value: ORG-1
```

Resolving

```
resourceType: PractitionerRole
practitioner:
  reference: Practitioner/p-1
organization:
  identifier:
    - system: urn:app:org-id
      value: ORG-1
```

1 match

```
resourceType: PractitionerRole
practitioner:
  reference: Practitioner/p-1
organization:
  reference: Organization/o-1
```

Applying

`resourceType: PractitionerRole`

`practitioner:`

`reference: Practitioner/p-1`

`organization:`

`reference: Organization/o-1`

Applying

`resourceType: PractitionerRole`

`practitioner:`

`reference: Practitioner/p-1`

`organization:`

`reference: Organization/o-1`



Create

Applying

```
resourceType: PractitionerRole
practitioner:
  reference: Practitioner/p-1
organization:
  reference: Organization/o-1
```



Create

```
resourceType: PractitionerRole
id: pr-1
practitioner:
  reference: Practitioner/p-1
organization:
  reference: Organization/o-1
```

Queue lifecycle

Practitioner
synced

Organization
synced

PractitionerRole
skipped

Queue lifecycle

Practitioner
synced

Organization
synced

PractitionerRole
synced

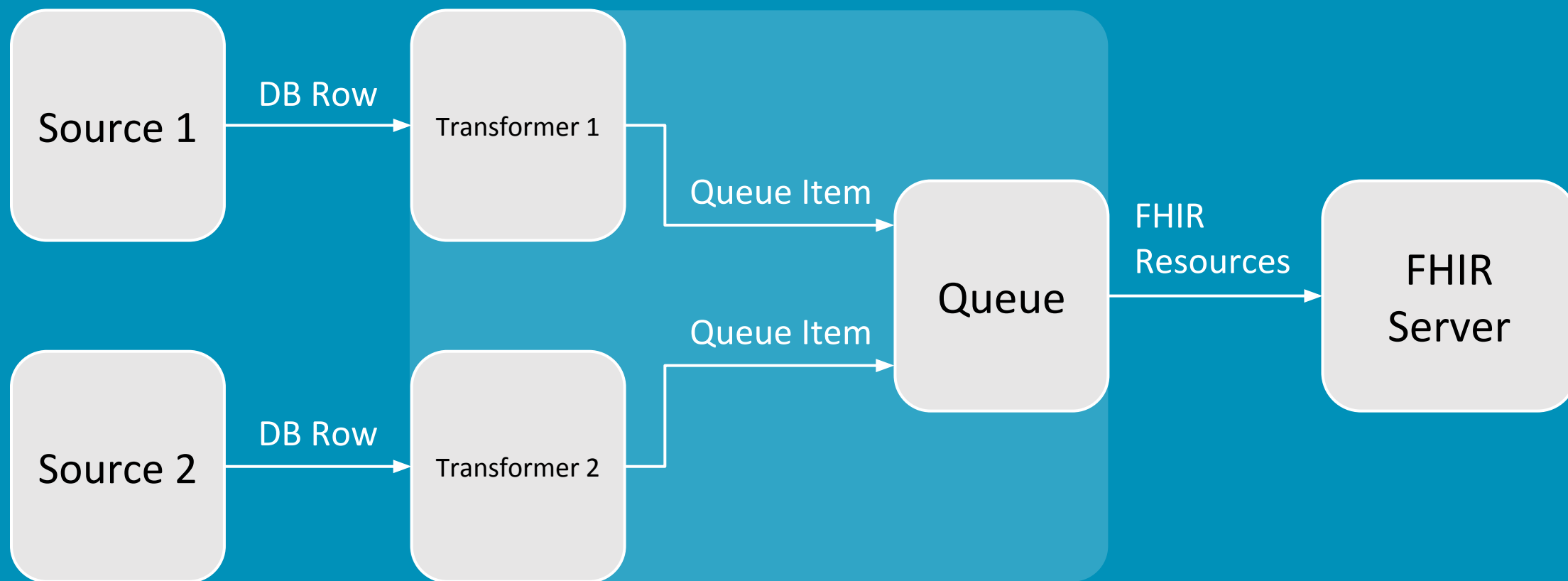
Queue lifecycle

Practitioner
synced

Organization
synced

PractitionerRole
synced

Import infrastructure



Problems

- ~~1. Non-FHIR structure~~
- ~~2. Relations between resources~~
- 3. Inconsistency**

Problems

- ~~1. Non-FHIR structure~~
- ~~2. Relations between resources~~
- ~~3. Inconsistency~~

Summary

7 sources

15 000 patients

200 000 related resources

10 hours of initial processing

Continuous import during development

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