



INTERWEAVE
CONNECTING CARE

Cookbook for Regional Interoperability Detailed Design Paper #011

Interfaces with the Personal Demographic Service (PDS)

PRELIMINARY DRAFT

Version 1.0 – 30th December 2019

Abstract Interoperability Cookbook Anchor Points

Section	Title
3.1.6	PIX/MPI Server
4.5	HL7 Messaging and PIX
5.3	Interactions with the Regional PIX/MPI

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Version Control

Version	Release Date	Released By	Reason for Release
1.0	30/12/2019	R Hickingbotham	Preliminary draft

Reviewers

Initials	Name	Role	Organisation

1 Introduction

1.1 Purpose of this Document

This document is one of a series of design papers which underpin the Abstract of a Cookbook for Regional Interoperability (the Abstract Cookbook). These papers, in their totality, describe the technical components and the standards which form the YHCR System of Systems (SoS). They are intended as a basis for developing or procuring software and so are expressed at a level of precision which aims to avoid ambiguity but consequentially, they are focussed to technical readers.

Design papers are anchored to topics which are discussed in the Abstract Cookbook. They are elaborations of the concepts which were first introduced by the abstract and new content is further detail rather than variations of previously established core principles.

This document (design paper 011 - "Interfaces with the Personal Demographic Service (PDS)") describes the relationship between the YHCR and the national SPINE service which manages NHS numbers is the primary source of demographic information about NHS users in England.

A relationship is required because:

1. The YHCR is responsible for aggregating information about a patient from different sources using the NHS number as the unique identifier for the patient. It has a duty of care to ensure that the different sources are referring to the same individual when using that NHS number.
2. The YHCR stores a 'golden record' for a patient which is searchable by its participants. Given PDS's status as the primary source of demographics then this record must be consistent with the data held on PDS.

1.2 Responsibilities of Participants to the YHCR for Demographic Data

The YHCR does not absolve its participants of responsibility for the probity of their data and specifically for correctly identifying the NHS Number for their patients and clients. Whether contributing as a data provider or a data consumer the participant relies on the NHS number to reference data. It must have taken measured steps to ensure that this identifier is correct before using it in interactions with the YHCR.

1.3 Determining the Equivalence of Two Demographic Datasets

PDS uses the following test to determine whether two demographic datasets are referring to the same individual:

- i) If the records have the same NHS Number and the year, month and day components of date of birth agree then the records refer to the same individual;
- ii) If the records have the same NHS Number and 2 out of 3 parts of the Date of Birth match (year or month or day), the first 3 characters of the Surname match and the initial character of the forename match then the records refer to the same individual.

The YHCR uses the same algorithm when matching demographics records held within the region.

1.4 Relationship of this Document with Other Standards

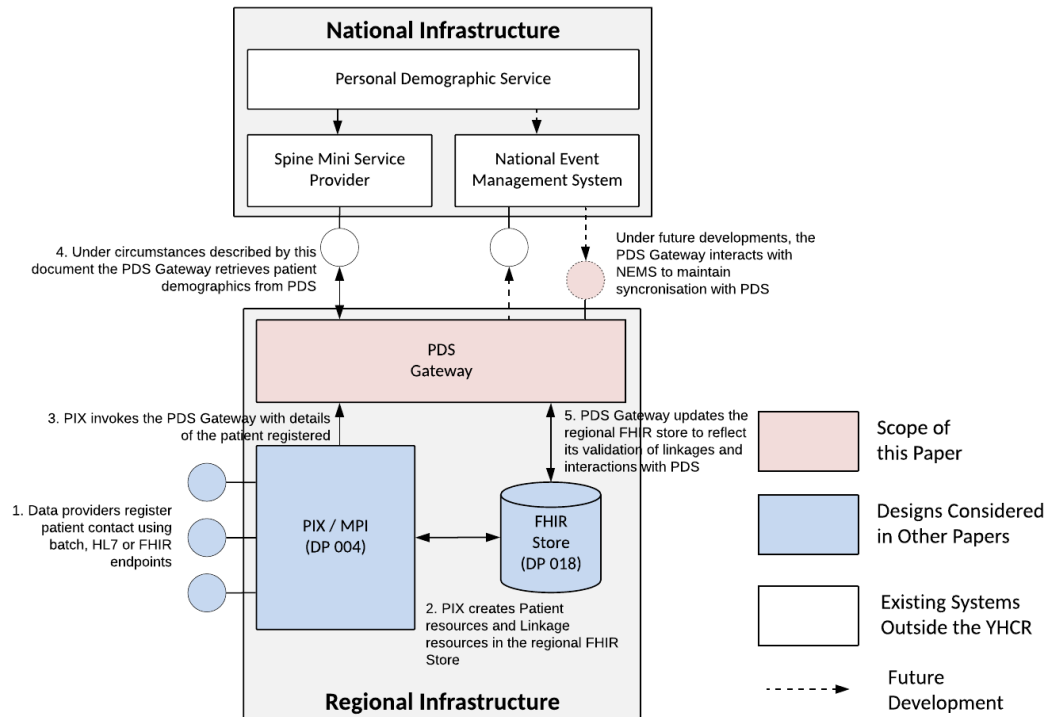
This paper relies on an understanding of the [PDS Spine Mini Service Provider](#) (SMSP) standards.

1.5 Intended Users of the This Document

Regional architects, clinical safety officers and developers of the System of Systems.

2 Relationship with Other Components of the System-of-Systems

This paper describes the functionality of a PDS Gateway Service. This service interacts with other components of the System-of-Systems and with national services as illustrated below.



Interactions are triggered through local patient contact which is registered with PIX/MPI. The role of the PDS Gateway is to build/refresh the golden patient record and to validate linkages to local demographics. Both the Patient and Linkage data structures are FHIR resources which are persisted in a regional FHIR Store.

The PDS Gateway interacts with PDS using the NHS Digital provided Spine Mini Services Provider.

2.1 Functions of the PDS Gateway

The functions performed by the PDS Gateway are:

- i) When a new patient is introduced to the YHCR then the PDS Gateway retrieves patient demographics from PDS and builds the patient resource.
- ii) When a new linkage is created (the first registration of an encounter by an organisation with a patient known to the YHCR) then the PDS Gateway verifies the equivalency of the demographic first through a local comparison of demographics with the golden patient records and if this fails then by refreshing the golden patient record from PDS.
- iii) The PDS Gateway maintains synchronisation with PDS.

The functionality is not accessible outside of the regional infrastructure and is only invoked by the PIX/MPI component.

2.2 Maintaining Synchronisation with PDS

Ultimately, the National Event Management Service will implement events which relate to PDS update. These will allow the PDS Gateway to subscribe to updates and be notified when a change occurs. The notification will be a trigger for the PDS Gateway to refresh the demographic records.

Until this capability is provided by NHS Digital then the PDS Gateway will refresh records periodically at the point that contact is recorded with the patient. The refresh will only occur if a record is stale and contact is registered with PIX/MPI. For this strategy to operate effectively, data providers should register all encounters with PIX, not just the first contact with a patient.

3 Processing Model

3.1 Fundamentals

The PDS Gateway is implemented as a micro-service which processes a single event which represents a *Linkage* being created for a *Patient* resource.

The event is invoked by MPI/PIX after it has created the relevant resources in a regional FHIR Store and the input parameters for the event are:

```
{
  "patient": <a reference to a Patient resource>,
  "linkage": <a reference to a Linkage resource>,
  "demographics": { // demographics as supplied to PIX by the
data provider
    "firstname": <string>, //at least 1 character
    "surname": <string>, // at least 3 characters
    "birthdate": <date> }
}
```

The Patient resource complies with the Care Connect profile and has an NHS number identifier. When a Patient is created by PIX/MPI the nhsNumberVerificationStatus extension to the identifier is set to:

```
02      Number present but not traced
```

This is an indicator to the PDS Gateway that it must retrieve the demographic from PDS and build the golden record.

The design uses the following properties of resources.

Property	Usage
Patient.active	A new patient that fails PDS tracing is marked by the PDS Gateway as inactive. The FHIR aggregator will not return results for inactive patients.
Patient.identifier(nhsNumber).extension(nhsNumberVerificationStatus)	Indicates whether demographic details must be obtained from PDS.
Patient.identifier(nhsNumber).period	The period of the validity of the identifier is set by the PDS Gateway and can be used to determine whether a record is stale. The FHIR Aggregator will use stale records but the PDS Gateway will refresh them on new contact.
Linkage.active	Linkages are created by PIX/MPI in inactive state. The PDS Gateway sets the state to active once the demographic equivalence has been confirmed. The FHIR Aggregator will not use inactive linkages to distribute queries.

3.2 Spine Mini Services Provider

The Spine Mini Services Provider is a Web Service which is operated by NHS Digital which implements the following web methods:

- verifyNHSNumber
- getNHSNumber
- getPatientDetailsByNHSNumber
- getPatientDetailsBySearch
- getPathientDetails (a consolidation of the previous 2 web methods)

This design uses the getPatientDetailsByNHSNumber method.

3.3 Event Queue Management and Error Handling

The PDS Gateway will process events from a queue. Errors in processing will be classified as transitory or permanent. Permanent errors will result in a Patient or Linkage being made inactive and cause a log item to be written which will trigger operator action. Transient errors will result in the event being returned to the event queue to be reprocessed. The delay between processing attempts will be configurable and is specified in the Operations Guide.

3.4 Processing Model Detail

1. Retrieve the Patient resource from the FHIR Store
2. If the nhsNumberVerificationStatus is not traced then
 - 2.1 Invoke the getPatientDetailsByNHSNumber service on the NHS Digital SMSP
 - 2.2 Validate the supplied demographics using the method in 1.3
 - 2.3 If the demographics do not match, then log a permanent error and mark the Patient as inactive and exit.
 - 2.4 Otherwise, populate the Patient resource with the PDS demographics and mark the Linkage as active and exit.
3. If the period attribute of the Patient identifier indicates that the record is stale, then
 - 3.1 Invoke the getPatientDetailsByNHSNumber service on the NHS Digital SMSP
 - 3.2 Populate the Patient resource with the PDS demographics
4. Test the equivalence of the supplied demographics with the Patient resource
 - 4.1 If they are equivalent, then mark the Linkage as active and exit.
 - 4.2 If the Patient resource was refreshed in 3. then mark the Linkage resource as inactive, Log the event and exit
 - 4.3 Otherwise mark the record as stale and process from step 3.1

3.5 Actions Resulting from Mismatched Records

It is requirement of participation that both data providers and data consumers only interact with the YHCR using PDS traced NHS numbers. Mismatches should therefore be rare.

Any mismatch is logged and will be available to monitoring tooling (design paper 021 – “Non-Functional Requirements for Regional Infrastructure”) and operators will be alerted.

YHCR operators will manually follow-up tracing issues with the registering participant and following correction will invite the registrant to reinvoke the PIX/MPI service for their patient encounter.

3.6 Responsibility of Data Consumers

The PDS Gateway does not validate the identity assumed for patients by data consumers. It is the responsibility for the data consumer to verify that the NHS number used to interrogate the YHCR is valid. The consumer can use the YHCR golden patient record to query demographics and to use this to validate their patient identification.

Appendix 1 – Maturity Matrix

Section	Narrative	Consultative	Draft	Normative
1 Introduction	X			
1.1 Purpose of this Document				
1.2 Responsibilities of Participants to the YHCR for Demographic Data				X
1.3 Responsibilities of Participants to the YHCR for Demographic Data		X		
1.4 Relationship of this Document with Other Standards	X			
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2 Relationship with Other Components of the System-of-Systems			X	
2.1 Functions of the PDS Gateway				
2.2 Maintaining Synchronisation with PDS			X	
3. Processing Model			X	
3.1 Fundamentals				
3.2 Spine Mini Service Provider	X			
3.3 Event Queue Management and Error Handling		X		
3.4 Processing Model Detail		X		
3.5 Actions Resulting from Mismatched Records		X		
3.6 Responsibility of Data Consumers		X		