**i2b2 Cell Messaging**

# Pulmonary Function Test Processing (PFT) Cell

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## 2  Document Version History

| Date | Version | Description | Author(s) |
|------|---------|-------------|-----------|
| 12/07/06 | 0.9 | Pre-Release Version | Kristel Hackett |
| 07/30/07 | 1.0 | Version 1.0 | Lori Phillips |
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# 3 Introduction

This document gives an overview of i2b2 cell messaging as well as a more detailed description of message formats specific to the Pulmonary Function Test (PFT) Processing Cell.

## 3.1 The i2b2 Hive

The Informatics for Integrating Biology and the Bedside (i2b2) is one of the sponsored initiatives of the NIH Roadmap National Centers for Biomedical Computing (http://www.bisti.nih.gov/ncbc/).  One of the goals of i2b2 is to provide clinical investigators broadly with the software tools necessary to collect and manage project-related clinical research data in the genomics age as a cohesive entity – a software suite to construct and manage the modern clinical research chart.  The i2b2 hive is a set of cells or modules that have a common messaging protocol that allow the cells to interact using web services and XML messages.

## 3.2 i2b2 Messaging Overview

All cells in the i2b2 hive communicate using a standard, pre-defined i2b2 XML message.  This message specifies certain properties that are common to cells and essential to the administration tasks associated with sending, receiving and processing messages.

A request message is sent from a client to a service and contains information, inside the top-level <request> tag, that allows the service to satisfy the request. The <request> tag contains a <message_header>, <request_header> and <message_body> as shown, below, in Figure 1.

The service sends back a response message, inside a top-level <response> tag, which informs the client about the status of the request and may also contain the actual results.  The <response> tag contains it's own <message_header>, <response_header> and <message_body> and it may optionally echo the request's <request_header> as shown, below, in Figure 1.
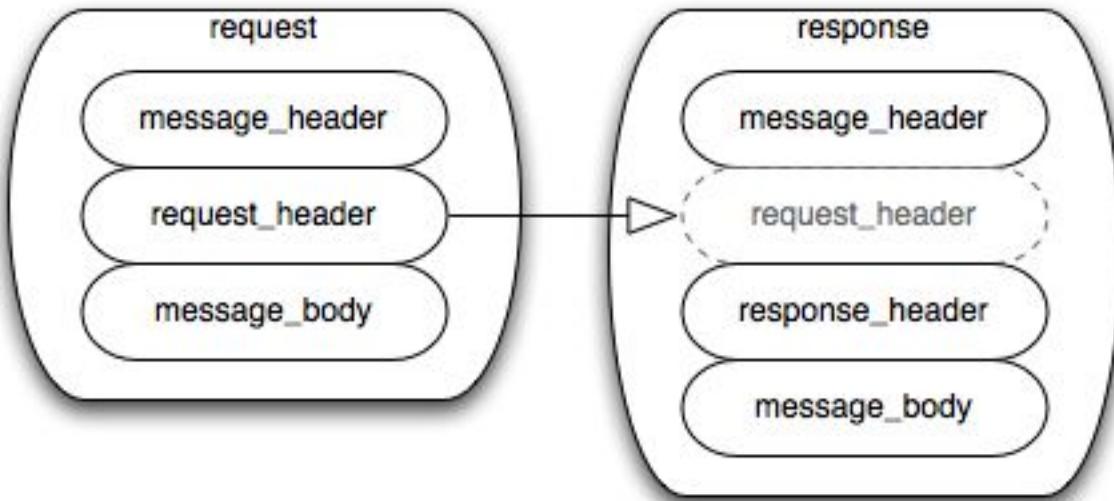
**Figure 1: The basic structure of a request and response message. The request_header in the request can be echoed in the response.**

The i2b2 XML schema consists of three XSD files:

- **i2b2.xsd**
  This schema is not used directly to create i2b2 messages, but is included in the i2b2_request.xsd and the i2b2_response.xsd. It defines the <message_header> tag.

- **i2b2_request.xsd**
  This schema is used for validating i2b2 request messages. It defines the <i2b2:request> tag, which includes the <message_header> tag.

- **i2b2_response.xsd**
  This schema is used for validating i2b2 response messages. It defines the <i2b2:response> tag, which includes the <message_header> tag.

# 4  The Pulmonary Function Test Processing (PFT) Cell Messaging Detail

The Pulmonary Function Test Processing Cell parses a pulmonary function report and extracts embedded test values. The report provided must be in a specific format.  This cell works as part of the hive for this specific localized purpose. Communication with the PFT Cell, like all cells in the i2b2 hive, occurs through web services.  The XML messages must conform to the i2b2 messaging standard, described above, which allows cell-specific XML within the <message_body> tag. The rest of this document describes PFT services and XML formats which are specific to the PFT Cell and it illustrates how these XML messages are used to accomplish a set of interactions that correspond to typical PFT use cases.

## 4.1  Use Case

The PFT Cell parses a pulmonary function report and extracts embedded test values.   The test values returned may be deposited into a data repository and used to create patient set queries or other types of analysis.
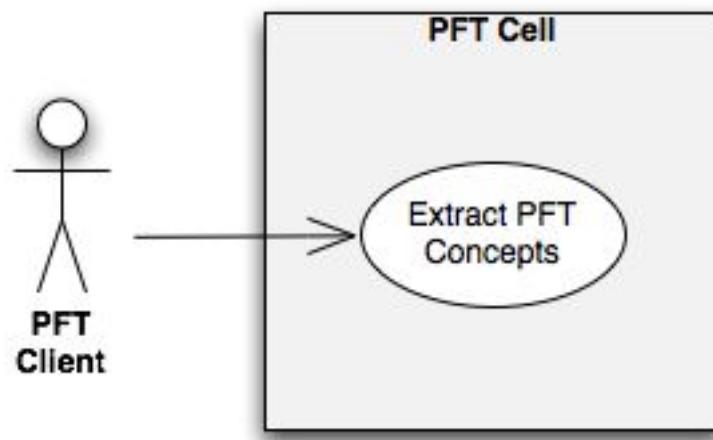


## 4.2  Services / Messages

The PFT Cell provides services that support the extraction of pulmonary function data from pulmonary function test reports.
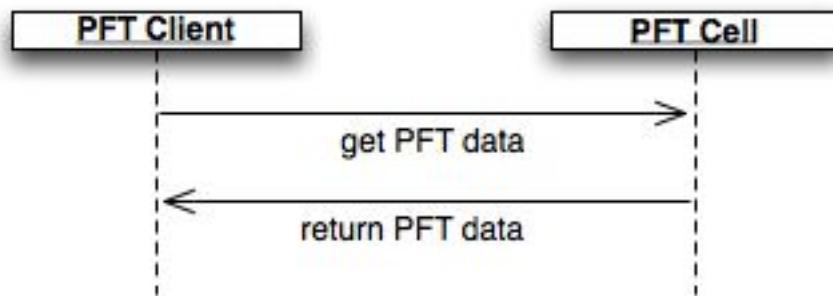
### 4.2.1 Extract Pulmonary Function Data

- Get a list of pulmonary function data from a pulmonary function report

## 4.3 Sequence Diagram

The following sequence diagrams illustrates the use case.

### 4.3.1 Extract Pulmonary Data Scenario



## 4.4 XML Schema Definitions

The PFT message does not use any PFT-specific XML. It uses the generic i2b2 patient data object (PDO), which is defined in the following three XSD files and in the separate PDO document. The i2b2_PDO.xsd is the main schema and the other two files, I2b2_PDO_fields.xsd and i2b2_PDO_types.xsd, are subsections.

- **i2b2_PDO.xsd**
  This schema is used for validating a PDO and defines a <patient_data> tag.

- **i2b2_PDO_fields.xsd**
  This schema is not used directly to validate a PDO but it is included in the i2b2_PDO.xsd schema. It defines different PDO building blocks.

- **i2b2_PDO_types.xsd**
  This schema is not used directly to validate a PDO but it is included in the i2b2_PDO_fields.xsd schema. It defines basic data types that are reused.

# 5  Example Messages

## 5.1  Extract Pulmonary Function Data

### 5.1.1  Extract Pulmonary Function Data Request

```
   <message_body>
       <patient_data>
           <observation_set>
               <observation sourcesystem_cd="RPDRPulmonary"
import_date="2007-08-27T16:19:30.340-04:00" download_date="2007-08-
27T16:19:30.340-04:00" update_date="2007-08-27T16:19:30.340-04:00">
                   <event_id>10000001</event_id>
                   <patient_id>1234567</patient_id>
                   <concept_cd>LCS-I2B2:pul</concept_cd>
                   <start_date>2007-07-31T13:26:57.637-04:00</start_date>
                   <observation_blob xsi:type="ns7:string"
xmlns:ns7="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">Date: xx/xx/xx
```

```
PT: DOE, JANE                                           DATE: xx/xx/xx

PT#: 12345678         AGE: 67   SEX: F    HT: 63.0 in      WT: 105.0 lb

PHYSICIAN: SMITH       TECH: ABC

DIAGNOSIS: DYSPNEA

SMK HX: NEVER
```

|  | | Predicted | Actual | %Pred | Actual | %Pred |
|---|---|---|---|---|---|---|
| | | | Pre-Drug* | | | |
| Spirometry %Change | | Predicted | Actual | %Pred | Actual | %Pred |
| FVC | (L) | 2.58 | 2.12 | 82 | | |
| FEV1 | (L) | 1.97 | 1.51 | 76 | | |
| FEV1/FVC | (%) | 77 | 71 | 92 | | |
| FEF25-75% | (L/S) | 1.79 | 1.09 | 61 | | |
| FEFmax | (L/S) | 5.16 | 2.70 | 52 | | |
| TET | (SEC) | | 9.66 | | | |

```
                                Pre-Drug*

_____TREND REPORT_____

     DATE       TIME        FVC        FEV1       FEV1/FVC    FEF25-75%
```

```
                    (L)          (L)          (%)          (L/S)

                    (PRE)        (PRE)        (PRE)        (PRE)

--------------------------------------------------------------------

   xx/xx/xx  08:25:40     2.12         1.51         71.36        1.09


_____

                </observation_blob>
             </observation>
         </observation_set>
      </patient_data>
  </message_body>
```

## 5.1.2  Extract Pulmonary Function Data Response

```
 <message_body>
    <patient_data>
        <observation_set>
            <observation>
                <event_id>10000001</event_id>
                <patient_id>1234567</patient_id>
                <concept_cd>LCS-I2B2:pulheight</concept_cd>
                <start_date>2007-07-31T13:26:57.637-04:00</start_date>
                <nval_num>63.0</nval_num>
                <units_cd>inch</units_cd>
            </observation>
            <observation>
                < event_id >10000001</event_id>
                <patient_id>1234567</patient_id>
                <concept_cd>LCS-I2B2:pulweight</concept_cd>
                <start_date>2007-07-31T13:26:57.637-04:00</start_date>
                <nval_num>105.0</nval_num>
                <units_cd>pound</units_cd>
            </observation>
            <observation>
                <event_id>10000001</event_id>
                <patient_id>1234567</patient_id>
                <concept_cd>LCS-I2B2:pulfev1obs</concept_cd>
                <start_date>2007-07-31T13:26:57.637-04:00</start_date>
                <nval_num>1.51</nval_num>
                <units_cd>liter</units_cd>
            </observation>
            <observation>
                <event_id>10000001</event_id>
                <patient_id>1234567</patient_id>
                <concept_cd>LCS-I2B2:pulfev1pred</concept_cd>
                <start_date>2007-07-31T13:26:57.637-04:00</start_date>
                <nval_num>76.0</nval_num>
                <units_cd>percent</units_cd>
            </observation>
            <observation>
```

```xml
                <event_id>10000001</event_id>
                <patient_id>1234567</patient_id>
                <concept_cd>LCS-I2B2:pulfvcobs</concept_cd>
                <start_date>2007-07-31T13:26:57.637-04:00</start_date>
                <nval_num>2.12</nval_num>
                <units_cd>liter</units_cd>
            </observation>
            <observation>
                <event_id>10000001</event_id>
                <patient_id>1234567</patient_id>
                <concept_cd>LCS-I2B2:pulfvcpred</concept_cd>
                <start_date>2007-07-31T13:26:57.637-04:00</start_date>
                <nval_num>82.0</nval_num>
                <units_cd>percent</units_cd>
            </observation>
        </observation_set>
    </patient_data>
</message_body>
```

# 6 Message Explanations

This section defines message elements specific to this cell's namespace.  The PFT message does not use any cell specific XML.  It utilizes the generic PDO <patient_data> element for both requests and responses.  Please refer to the generic PDO document for explanations of PDO elements.