



i2b2 Cell Messaging  
**Data Repository (CRC) Cell**

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## 1. INTRODUCTION

This document gives an overview of i2b2 cell messaging as well as a more detailed description of the Patient Data Object (PDO) xml data format.

### 1.1 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.

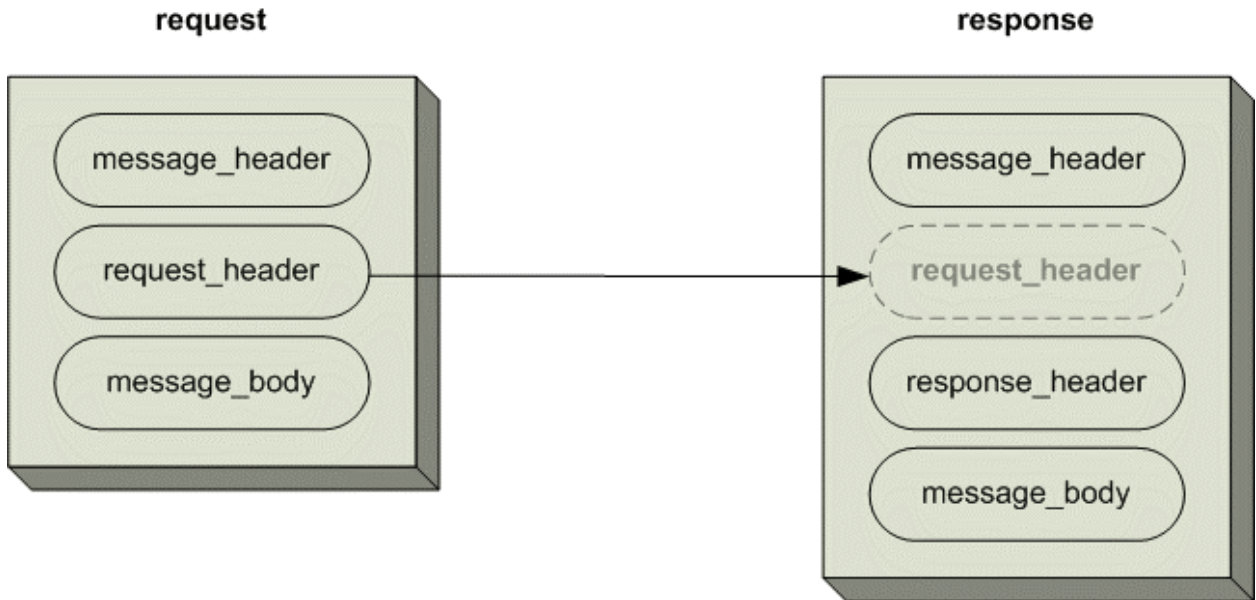
### 1.2 i2b2 Cell Messaging

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

All requests are sent using a <request> tag and responses are returned using a <response> tag. The same <message\_header> tag is used for both. The <request\_header> is used for requests but may optionally be echoed back in the response. The response must include a <response\_header>.

The XSD specification of the i2b2 message permits individual cells to add cell-specific XML in the <message\_body> tag. This cell-specific XML need not extend the i2b2 message schema since the i2b2 schema will allow insertion of tags from any namespace into the <message\_body> tag.

The following image illustrates the basic top-level elements contained within the request and response messages.



## 1.2.1 i2b2 XML Schema Definitions

The i2b2 XML schema consists of three XSD files:

### 1.2.1.1 I2B2.XSD

The **i2b2.xsd** 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.

### 1.2.1.2 I2B2\_REQUEST.XSD

The **i2b2\_request.xsd** schema is used for validating i2b2 request messages. It defines the `<i2b2:request>` tag, which includes the `<message_header>` tag.

### 1.2.1.3 I2B2\_RESPONSE.XSD

The **i2b2\_response.xsd** schema is used for validating i2b2 response messages. It defines the `<i2b2:response>` tag, which includes the `<message_header>` tag.

## 2. PATIENT DATA OBJECT (PDO)

The Patient Data Object is a representation of patient data.

### 2.1 PDO XML Schema Definitions

The Patient Data Object (PDO) XML schema consists of three XSD files:

#### 2.1.1 i2b2\_PDO.xsd

The **i2b2\_PDO.xsd** schema is used for validating a PDO and defines a `<patient_data>` tag.

#### 2.1.2 i2b2\_PDO\_fields.xsd

The **i2b2\_PDO\_fields.xsd** 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.

#### 2.1.3 i2b2\_PDO\_types.xsd

The **i2b2\_PDO\_types.xsd** 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.

## 2.2 Example Object

```
<repository:patient_data xmlns:repository="http://i2b2.mgh.harvard.edu/repository_cell:
xsi:schemaLocation="http://i2b2.mgh.harvard.edu/repository_cell/patient_data.xsd">
  <event_set>
    <event update_date="2006-05-04T18:13:51.0Z"
download_date="2006-05-04T18:13:51.0Z"
import_date="2006-05-04T18:13:51.0Z"
sourcesystem_cd="sourcesystem_cd0"
upload_id="upload_id0">
      <event_id source="HIVE">event_id0</event_id>
      <patient_id source="HIVE">patient_id0</patient_id>
      <param column="inout_cd" type="string" name=""
        column_descriptor="in vs. outpatient code"></param>
      <param column="location_cd" type="string" name=""
        column_descriptor="location code"></param>
```

```
<param column="location_path" type="string" name=""
  column_descriptor="location hierarchy"></param>
<param column="active_status_cd" type="string" name=""
  column_descriptor="date interpretation code"></param>
<start_date>2006-05-04T18:13:51.0Z</start_date>
<end_date>2006-05-04T18:13:51.0Z</end_date>
<event_blob></event_blob>
</event>
</event_set>
```

```
<concept_set>
  <concept update_date="2006-05-04T18:13:51.0Z"
    download_date="2006-05-04T18:13:51.0Z"
    import_date="2006-05-04T18:13:51.0Z"
    sourcesystem_cd="sourcesystem_cd3"
    upload_id="upload_id3">
    <concept_path>concept_path0</concept_path>
    <concept_cd>concept_cd0</concept_cd>
    <name_char>name_char0</name_char>
    <concept_blob></concept_blob>
  </concept>
</concept_set>
```

```
<observer_set>
  <observer update_date="2006-05-04T18:13:51.0Z"
    download_date="2006-05-04T18:13:51.0Z"
    import_date="2006-05-04T18:13:51.0Z"
    sourcesystem_cd="sourcesystem_cd6" upload_id="upload_id6">
    <observer_path>observer_path0</observer_path>
    <observer_cd>observer_cd0</observer_cd>
    <name_char>name_char3</name_char>
    <observer_blob></observer_blob>
  </observer>
</observer_set>
```

```
<pid_set>
  <pid>
    <patient_id status="status0" update_date="2006-05-04T18:13:51.0Z"
      download_date="2006-05-04T18:13:51.0Z"
      import_date="2006-05-04T18:13:51.0Z"
      sourcesystem_cd="sourcesystem_cd9"
      upload_id="upload_id9" source="HIVE">patient_id3</patient_id>
```

```

    <patient_map_id source="HIVE" status="status1"
      update_date="2006-05-04T18:13:51.0Z"
      download_date="2006-05-04T18:13:51.0Z"
      import_date="2006-05-04T18:13:51.0Z"
      sourcesystem_cd="sourcesystem_cd10"
      upload_id="upload_id10">patient_map_id0</patient_map_id>
  </pid>
</pid_set>

<eid_set>
  <eid>
    <event_id source="HIVE" patient_id="patient_id6" patient_id_source="HIVE"
      status="status6" update_date="2006-05-04T18:13:51.0Z"
      download_date="2006-05-04T18:13:51.0Z"
      import_date="2006-05-04T18:13:51.0Z"
      sourcesystem_cd="sourcesystem_cd15"
      upload_id="upload_id15">event_id3</event_id>
    <event_map_id source="HIVE" patient_id="patient_id7"
      patient_id_source="HIVE" status="status7"
      update_date="2006-05-04T18:13:51.0Z"
      download_date="2006-05-04T18:13:51.0Z"
      import_date="2006-05-04T18:13:51.0Z"
      sourcesystem_cd="sourcesystem_cd16"
      upload_id="upload_id16">event_map_id0</event_map_id>
  </eid>
</eid_set>

<patient_set>
  <patient update_date="2006-05-04T18:13:51.0Z"
    download_date="2006-05-04T18:13:51.0Z"
    import_date="2006-05-04T18:13:51.0Z"
    sourcesystem_cd="sourcesystem_cd21"
    upload_id="upload_id21">
    <patient_id source="HIVE">patient_id12</patient_id>
    <param column="vital_status_cd" type="string" name=""
      column_descriptor="date interpretation code">param3</param>
    <param column="birth_date" type="dateTime" name=""
      column_descriptor="birthdate">param3</param>
    <param column="death_date" type="dateTime" name=""
      column_descriptor="date of death">param3</param>
    <param column="sex_cd" type="string" name=""
      column_descriptor="gender">param3</param>
    <param column="age_in_years_num" type="string" name=""
      column_descriptor="age">param3</param>
    <param column="language_cd" type="string" name=""

```

```

        column_descriptor = "language">param3</param>
    <param column="race_cd" type="string" name=""
        column_descriptor="race">param3</param>
    <param column="religion_cd" type="string" name=""
        column_descriptor = "religion">param3</param>
    <param column="marital_status_cd" type="string" name=""
        column_descriptor="marital status">param3</param>
    <param column="statecityzip_path_char" type="string" name=""
        column_descriptor="zip code hierarchy">param3</param>
    <patient_blob></patient_blob>
</patient>
</patient_set>

<observation_set panel_name="panel_name0">
    <observation update_date="2006-05-04T18:13:51.0Z"
    download_date="2006-05-04T18:13:51.0Z"
    import_date="2006-05-04T18:13:51.0Z"
    sourcesystem_cd="sourcesystem_cd24"
    upload_id="upload_id24">
        <event_id source="HIVE">event_id6</event_id>
        <patient_id source="HIVE">patient_id15</patient_id>
        <concept_cd name="name6">concept_cd3</concept_cd>
        <observer_cd source="source0">observer_cd3</observer_cd>
        <start_date>2006-05-04T18:13:51.0Z</start_date>
        <modifier_cd name="name7">modifier_cd0</modifier_cd>
        <valuetype_cd>valuetype_cd0</valuetype_cd>
        <tval_char>tval_char0</tval_char>
        <nval_num units="units0">3.141592653589</nval_num>
        <valueflag_cd name="name8">valueflag_cd0</valueflag_cd>
        <quantity_num>3.141592653589</quantity_num>
        <units_cd>units_cd0</units_cd>
        <end_date>2006-05-04T18:13:51.0Z</end_date>
        <location_cd name="name9">location_cd0</location_cd>
        <confidence_num>3.141592653589</confidence_num>
        <observation_blob></observation_blob>
    </observation>
</observation_set>

</repository:patient_data>

```



### 3. OBJECT EXPLANATIONS

#### 3.1 Patient Data

Object	Explanation
PatientData	The root element that holds data from the patient data tables. May contain any number of visit_dimension, concept_dimension, provider_dimension, patient_dimension and observation_fact elements. They can occur in any order

#### 3.2 Event Set

Object	Explanation										
event_set	Data from the visit_dimension table										
event	One row of data from the visit_dimension table.										
event_id	A choice between Encounter_Num (if source is HIVE) or Encounter_Id if another source. A source with "_e" at the end is encrypted.										
patient_id	A choice between Patient_Num, (if source is HIVE) or Patient_Id if another source. A source with "_e" at the end is encrypted.										
start_date	The date-time that the event started.										
end_date	The date-time that the event ended.										
active_status_cd	A code to represent the meaning of the date fields above.										
param	<p>ds in the table will be returned as name/value &lt;param&gt; element.            nent has the following attributes.</p> <table border="1"> <thead> <tr> <th>Attribute</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>column</td> <td>Database column name</td> </tr> <tr> <td>column_descriptor</td> <td>Description for the database column</td> </tr> <tr> <td>type</td> <td>Data type of the field in the XML data type format.</td> </tr> <tr> <td>name</td> <td>Description of the param value.</td> </tr> </tbody> </table>	Attribute	Description	column	Database column name	column_descriptor	Description for the database column	type	Data type of the field in the XML data type format.	name	Description of the param value.
Attribute	Description										
column	Database column name										
column_descriptor	Description for the database column										
type	Data type of the field in the XML data type format.										
name	Description of the param value.										

event_blob	XML data that includes partially structured and unstructured data about a visit.

### 3.3 Concept Set

Object	Explanation
concept_set	Data from the concept_dimension table
concept	One row of data from the concept_dimension table.
concept_path	A path that represents the hierarchical specification of the concept
concept_cd	A unique code that represents a concept.
name_char	A string name that represents this concept, idea or person.
concept_blob	XML data that includes partially structured and unstructured data about a concept.

### 3.4 Observer Set

Object	Explanation
observer_set	Data from the provider_dimension table
observer	One row of data from the provider_dimension table.
observer_path	A path that represents the hierarchical specification of the observer
observer_cd	A unique code that represents an observer.
name_char	A string name that represents this observer, could be person or machine.
observer_blob	XML data that includes partially structured and unstructured data about an observer.

### 3.5 PID Set

Object	Explanation
pid_set	Data from the patient_mapping table
pid	One set of mappings on a single patient_num
patient_id	A choice between Patient_Num, (if source is HIVE) or Patient_Id if another source. A source with "_e" at the end is encrypted.
patient_map_id	A patient_id that should have the same patient_num as the patient_id in this pid.

### 3.6 EID Set

Object	Explanation
eid_set	Data from the encounter_mapping table
eid	One set of mappings on a single visit_num
event_id	A choice between visit_num, (if source is HIVE) or Visit_Id if another source. A source with "_e" at the end is encrypted.
event_map_id	A visit_id that should have the same patient_num as the visit_id in this eid.

### 3.7 Observation Set

Object	Explanation
observation_set	Data from the observation_fact table.
Observation	One row of data from the observation_fact table.
event_id	A choice between encounter_num (if source is HIVE) or encounter_id if an other source. A source with "_e" at the end is encrypted.
patient_id	A choice between patient_num, (if source is HIVE) or patient_id if another source. A source with "_e" at the end is encrypted.
concept_cd	A unique code that represents a concept.

observer_cd	An ID that represents the provider, which could be a physician or a machine such as an MRI machine.
start_date	The date that the observation was made, or that the observation started. If the data is derived or calculated from another observation (like a report) then the start date is the same as the observation it was derived or calculated from.
modifier_cd	hierarchical derivations of a common observation
ValType_Cd	A code representing whether a value is stored in the TVal column, NVal column, or observation_blob column.
TVal_Char	A text value.
NVal_Num	A numerical value.
ValueFlag_Cd	A code that represents the type of value present in the NVal_Num, the TVal_Char or observation_blob column
Quantity_Num	The number of observations represented by this fact.
Units_Cd	A textual description of the units associated with a value.
End_Date	The date that the observation ended. If the data is derived or calculated from another observation (like a report) then the end_date is the same as the observation it was derived or calculated from.
Location_Cd	A code representing the hospital associated with this visit.
Confidence_Num	A code or number representing the confidence in the accuracy of the data.
Observation_Blob	XML data that includes partially structured and unstructured data about an observation.

### 3.8 Patient Set

Object	Explanation
patient_set	data from the visit_dimension table
patient	One row of data from the visit_dimension table.
patient_id	A choice between patient_num, (if source is HIVE) or patient_id if another source. A source with "_e" at the end is encrypted.
start_date	The date-time that the patient was born.
end_date	The date-time that the patient died.

vital_status_cd	A code to represent the meaning of the date fields above.
param	Name value field. Please refer to the Event Set's param explanation.
patient_blob	XML data that includes partially structured data about a patient

### 3.9 Admin Fields

Object	Explanation
Update_Date	The date the data was last updated according to the source system from which the data was obtained. If the source system does not supply this data, it defaults to the download_date.
Download_Date	The date that the data was obtained from the source system. If the data is derived or calculated from other data, then the download_date is the date of the calculation.
Import_Date	The date the data is placed into the table of the data mart.
SourceSystem_Cd	A code representing the source system that provided the data.
Upload_Id	Tracking number assigned to any file uploaded.