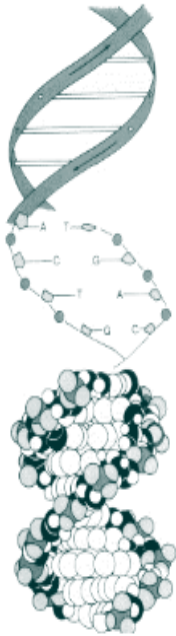


I2b2 - SHRINE support for Clinical Trails and the Substitutable Medical Applications and Reusable Technologies (SMART) project



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I2b2 to support specific use case: Recruiting Patients for Clinical Trials

- At an institution, sets of patients that result from queries can be reviewed after appropriate permissions are obtained to be recruited for clinical trials.
- SHINE will allow a federated query to be performed across i2b2 SHINE databases, and the resulting patient population can be reviewed and recruited for clinical trials with the involvement of a coordinating center.

i2b2 Web Client - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://smarti2b2.org/webclient2/#

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i2b2 Web Client

i2b2 Query & Analysis Tool Find Patients | View Patient | Analysis Tools | Message Log | Help | Logout

Navigate Terms Find Terms

- Ischemic heart disease
 - Acute myocardial infarction
 - Angina pectoris
 - Old myocardial infarction
 - Other acute and subacute forms of ischemic heart
 - Other forms of chronic ischemic heart disease
- Other forms of heart disease
- Venous and lymphatic disease
- Conditions in the perinatal period
- Congenital anomalies
- Digestive system
- Endocrine disorders
- Events of pregnancy
- Genitourinary system
- Hematologic diseases
- Infectious and parasitic diseases
- Injury and poisoning
- Mental Disorders
- Metabolic and immunity disorders
- Musculoskeletal and connective tissue
- Neoplasms
- Neurologic Disorders
- Nutritional deficiencies

Query Tool

Query Name:

Group 1			Group 2			Group 3		
Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude
Old myocardial infarction								
one or more of these			AND			drop a term on here		

Run Query New Query 1 Group New Group

Query Status

Finished Query: "Old myocardial @00:03:27"

Patient Set - 1 Patients - 1 patients FINISHED [4.5 secs]

Patient Count - 1 patients FINISHED [4.5 secs]

Transferring data from smarti2b2.org...

i2b2 Web Client - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://smarti2b2.org/webclient2/#

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i2b2 Web Client

i2b2 Query & Analysis Tool Find Patients | View Patient | Analysis Tools | Message Log | Help | Logout

Navigate Terms Find Terms

- Ischemic heart disease
 - Acute myocardial infarction
 - Angina pectoris
 - Old myocardial infarction
 - Other acute and subacute forms of ischemic heart

Workplace

- i2b2 Patients

Previous Queries

- Old myocardial @00:03:27 [10-11-2011] [i2b2]
 - Results of Old myocardial @00:03:27 [10-11-2011] [i2b2]
 - Patient Set - 1 patients
 - 1000000096 [76 y/o F black]
 - Patient Count - 1 patients
 - Visit Anti-in@23:57:33 [10-11-2011] [i2b2]

Query Tool

Query Name:

Group 1			Group 2			Group 3		
Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude
Old myocardial infarction								
one or more of these			AND			drop a term on here		

Run Query New Query 1 Group New Group

Query Status

Finished Query: "Old myocardial @00:03:27"

Patient Set - 1 Patients - 1 patients FINISHED [4.5 secs]

Patient Count - 1 patients FINISHED [4.5 secs]

Transferring data from smarti2b2.org...

i2b2 Web Client - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://smarti2b2.org/webclient2/#

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i2b2 Web Client

i2b2 Query & Analysis Tool Find Patients | View Patient | Analysis Tools | Message Log | Help | Logout

Navigate Terms Find Terms

- Ischemic heart disease
- Acute myocardial infarction
- Angina pectoris
- Old myocardial infarction
- Other acute and chronic myocardial infarction
- Other forms of myocardial infarction

Workplace

i2b2 Patients

Previous Queries

- Old myocardial @00:03:21
- Results of Old myocardial
- Patient Set - 1 patient
- 1000000096 [76 y/o F black]
- Patient Count - 1 patient
- Visit Anti.in@23:57:33.11

View Patient 1000000096 [76 y/o F black]

SMART EMR View Patient Number: 1000000096

Yolande Ondersma

MRN: PHS:1000000096 10 MAIN ST
 Sex: Female Boston, Massachusetts
 Born: 1934-05-01 (Age: 77) 02228 USA

Customize EMR View

Select View

- Problem List**
- Default View
- Medications
- Allergy Treatments

Problem List

Hypothyroidism (disorder)	2003-04-15	2005-04-15
Hypothyroidism (disorder)	2003-04-15	2005-04-15
Malignant tumor of thyroid gland (disorder)	1999-06-03	2001-06-03
Malignant tumor of thyroid gland (disorder)	1999-06-03	2001-06-03
Old myocardial infarction (disorder)	1997-10-30	1999-10-30
Old myocardial infarction (disorder)	1997-10-30	1999-10-30
Osteoarthritis (disorder)	2006-03-15	2008-03-19
Osteoarthritis (disorder)	2006-03-15	2008-03-19
Osteopenia (disorder)		

Transferring data from smarti2b2.org...

i2b2 Web Client - Mozilla Firefox

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i2b2 Web Client

i2b2 Query & Analysis Tool Find Patients | View Patient | Analysis Tools | Message Log | Help | Logout

Navigate Terms Find Terms

- Ischemic heart disease
 - Acute myocardial infarction
 - Angina pectoris
 - Old myocardial infarction
 - Other acute and chronic forms of ischemic heart disease
 - Other forms of ischemic heart disease

Workplace

- i2b2 Patients

Previous Queries

- Old myocardial @00:03:21
- Results of Old myocardial @00:03:21
 - Patient Set - 1 patient
 - 1000000096 [76 y/o F black]
 - Patient Count - 1 patient
- Visit Anti.in@23:57:33.11

View Patient 1000000096 [76 y/o F black]

SMART EMR View Return to Normal Mode Patient Number: 1000000096

Yolande Ondersma

MRN: PHS:1000000096 10 MAIN ST
 Sex: Female Boston, Massachusetts
 Born: 1934-05-01 (Age: 77) 02228 USA

App Library Click an icon to add a new SMART app

Got Statins? Problems 2.0 Person Info Got Claritin? Med List

Select View

- Problem List**
- Default View
- Medications
- Allergy Treatments

Save Layout Rename Delete View

Problem List

Problem	Start Date	End Date
Hypothyroidism (disorder)		
Hypothyroidism (disorder)	2003-04-15	2005-04-15
Malignant tumor of thyroid gland (disorder)		
Malignant tumor of thyroid gland (disorder)	1999-06-03	2001-06-03
Old myocardial infarction (disorder)		
Old myocardial infarction (disorder)	1997-10-30	1999-10-30
Osteoarthritis (disorder)		
Osteoarthritis (disorder)	2006-03-15	2008-03-19
Osteopenia (disorder)		

Done

i2b2 Web Client - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://smarti2b2.org/webclient2/#

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i2b2 Web Client

i2b2 Query & Analysis Tool Find Patients | View Patient | Analysis Tools | Message Log | Help | Logout

1000000096 [76 y/o F black]

View Patient

SMART EMR View Return to Normal Mode Patient Number: 1000000096

Yolande Ondersma

MRN: PHS:1000000096 10 MAIN ST
 Sex: Female Boston, Massachusetts
 Born: 1934-05-01 (Age: 77) 02226 USA

App Library Click an icon to add a new SMART app

Problems Mini Statins Got Statins 3? Got Statins 4? EMR View

Select View

- Problem List
- Default View
- Medications**
- Allergy Treatments

Medications Save Layout Rename Delete View

Got Claritin? **NO** Mini Statins Got Statins? **NO**

Workplace

- i2b2 Patients

Previous Queries

- Old myocardial @00:03:2
- Results of Old myocar
- Patient Set - 1 patie
- 1000000096 [76
- Patient Count - 1 pa
- Visit - Anti-in@73-57-33,11

Done

i2b2 Web Client - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://smarti2b2.org/webclient2/#

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i2b2 Web Client

i2b2 Query & Analysis Tool Find Patients | View Patient | Analysis Tools | Message Log | Help | Logout

PATIENT:100000002

View Patient

SMART EMR View Patient Number: 100000002

Shani Beckstrand

MRN: PHS:1000000002 10 MAIN ST
 Sex: Female Boston, Massachusetts
 Born: 1966-08-29 (Age: 45) 02142 USA

Customize EMR View

Select View

- Problem List
- Default View
- Medications**
- Allergy Treatments

Medications

Med List Timeline

- The List (j=down, k=up)

Medication	Instructions
12 HR Guafenesin 600 MG / Pseudoephedrine 60 MG Extended Release Tablet [Syn-Rx]	None
180 ACTUAT Beclomethasone	

Mini Status

Got Statins? **NO**

Got Claritin? **YES**


Done


Privacy assumptions:

- 1 – An IRB has been approved at that site (or across sites) for a study and that IRB is attached to specific project. DUA's (or the equivalent) have been signed by all project members.
- 2 – At the site where the patients have signed the HIPAA notification, the PHI of specific sets of patients can be made available to the investigators. The specific set of patients will be defined by a patient list created in (1) and “promoted” to the level of PHI by transferring the list to a well defined access control place. Accesses to the PHI of these patients will be reported on all HIPAA audits for the patients.

In keeping with the above, components for development are:

- 1. Regulatory i2b2 infrastructure to support management of permissions across institutions to enable clinicians and support staff to participate in a multicenter trial
 - A. The authorization that ultimately leads to the creation of a patient-set and the ability to review the patients that make up the set will be administered by creating a similarly identified project at each institution's local i2b2 that is tied to specific local and global authorizations (such as IRB protocols).
 - B. All (including multisite) investigators in the project will be authorized to use the entire project data set as Limited Data Set Users (LDS user). The creation of patient sets will be enabled in this fashion.

- 
- 2. Detailed patient data is available to the members of the project. This will allow the review and sorting of the patient sets and initial screening of patients using tools in i2b2 that allow viewing of Limited Data.
 - A. The creation and definition of patient sets at the LDS level will be possible through the i2b2 workplace.
 - B. A patient set that is created in the workplace can be requested for identification by the Investigators at the local site. Activity up to this point is leading up to this designation. The patients in the set are available to HIPAA audits, labeled with those users that had access to the PHI.

- 
- 3. The patients that are on the specific lists with access by local users in the specific project will have PHI revealed. [There may be a configurable switch in the local hive will determine if a coordinating center has access to the PHI.]
 - A. Patients who are approved to have their identified data displayed will clearly appear in the workplace and be available to drag to the SMART lookup. The SMART lookup will allow a display of the EMR view for a patient..

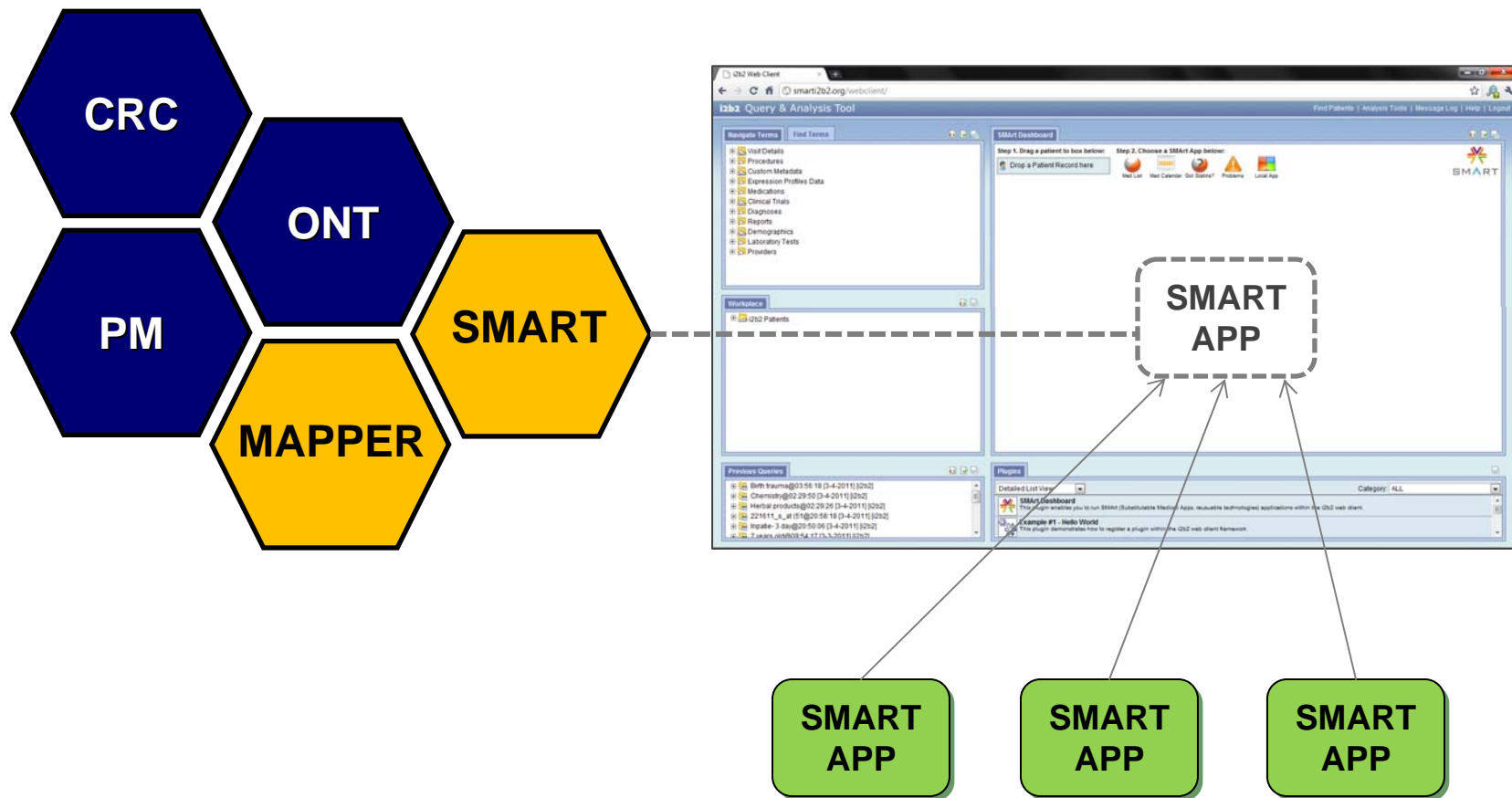
What is the SMART project about?



SMART

- Substitutable Medical Apps, reusable technologies
- Provides a unified mechanism for diverse apps to interact with medical record data – An iPad kind of App that fits into AJAX model of web browsing
- Enables **SMART Apps** built against a **SMART API** to be embedded within any **SMART Container**
- A **SMART Container** can be an EMR system used by physicians, or a PHR system used by patients...or a data-analytics platform such as **i2b2** used by researchers

SMART apps can be used to review detailed patient data, as LDS and as PHI (if part of authorized patient set)?



SMART Container in i2b2

The screenshot displays the i2b2 Query & Analysis Tool interface. The browser address bar shows the URL `smarti2b2.org/webclient/`. The main header includes navigation links: `Find Patients | Analysis Tools | Message Log | Help | Logout`.

The interface is divided into several panels:

- Navigate Terms:** A tree view containing categories such as Visit Details, Procedures, Custom Metadata, Expression Profiles Data, Medications, Clinical Trials, Diagnoses, Reports, Demographics, Laboratory Tests, and Providers.
- Workplace:** A panel containing a single entry labeled "i2b2 Patients".
- Previous Queries:** A list of recent queries with details like "Birth trauma@03:56:18 [3-4-2011] [i2b2]".
- SMART Dashboard:** The central workspace for running SMART applications. It features two steps: "Step 1. Drag a patient to box below:" with a "Drop a Patient Record here" button, and "Step 2. Choose a SMART App below:" with icons for Med List, Med Calendar, Got Stats?, Problems, and Local App. The SMART logo is visible in the top right of this panel.
- Plugins:** A panel showing installed plugins, including "SMARt Dashboard" and "Example #1 - Hello World".

SMART Container in i2b2

The screenshot displays the i2b2 Query & Analysis Tool interface. The browser address bar shows `smarti2b2.org/webclient/#`. The main navigation bar includes "Find Patients", "Analysis Tools", "Message Log", "Help", and "Logout".

Left Panel:

- Navigate Terms:** A tree view containing categories like Visit Details, Procedures, Custom Metadata, Expression Profiles Data, Medications, Clinical Trials, Diagnoses, Reports, Demographics, Laboratory Tests, and Providers.
- Workplace:** A list of patient identifiers, including "PATIENT:1000000001" through "PATIENT:1000000013".
- Previous Queries:** A list of recent queries with details such as "Birth trauma@03:56:18 [3-4-2011] [i2b2]".

SMART Dashboard:

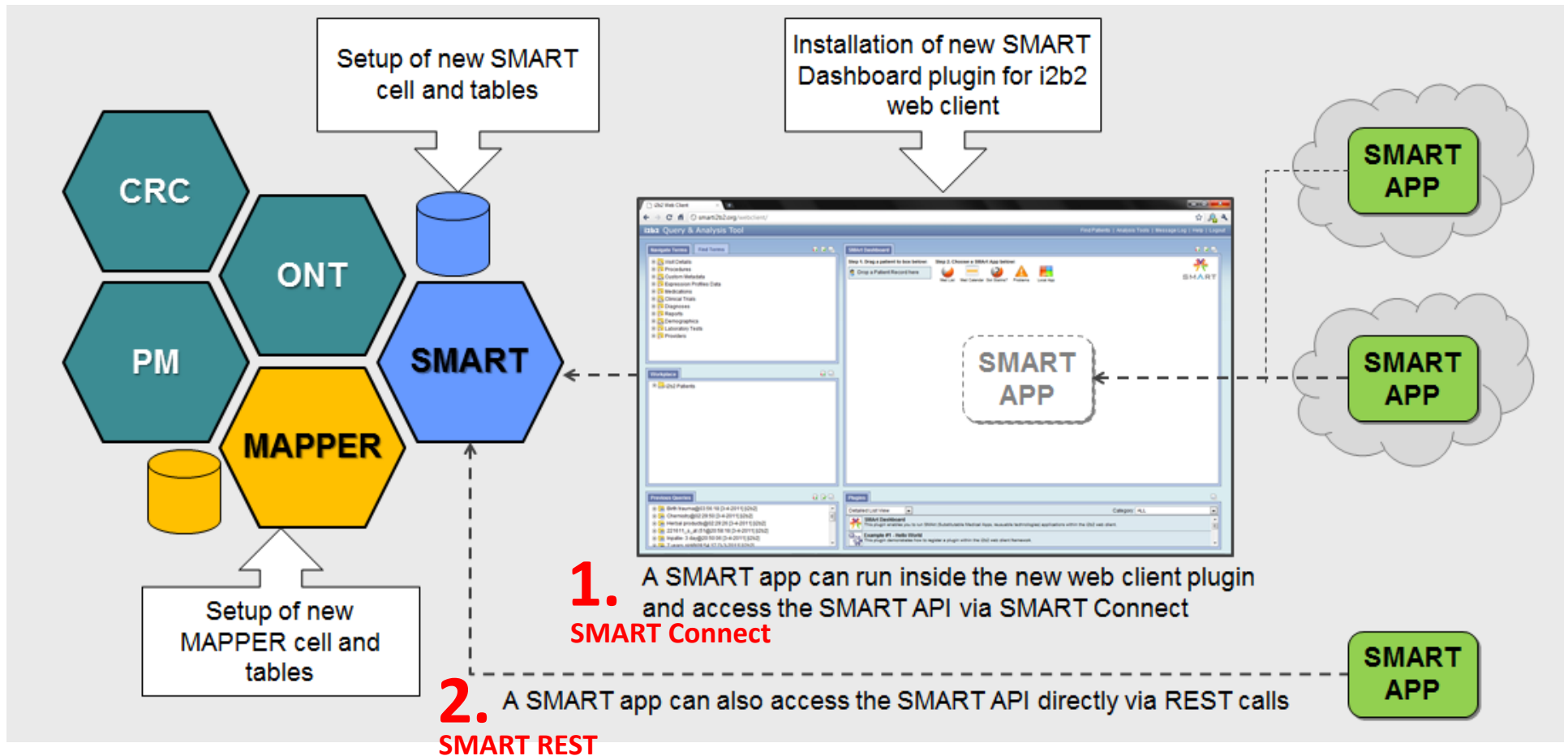
- Step 1:** "Drag a patient to box below:" with a text input field containing "PATIENT:1000000008".
- Step 2:** "Choose a SMART App below:" with icons for Med List, Med Calendar, Got Stats?, Problems, and Local App.
- SMART Logo:** Located in the top right corner of the dashboard.
- Buttons:** "Calendar" and "Medication" buttons are visible.
- Prescriptions Table:**

Name	Start Date	Est. End Date	Instructions
100 ACTUAT Beclomethasone Dipropionate 0.08 MG/ACTUAT Metered Dose Inhaler [Qvar]	Thu Apr 04 2002	Sun Apr 04 2004	
200 ACTUAT Ipratropium Bromide 0.018 MG/ACTUAT Metered Dose Inhaler [Atrovent]	Thu Apr 04 2002	Sun Apr 04 2004	
200 ACTUAT Ipratropium Bromide 0.018 MG/ACTUAT Metered Dose Inhaler [Atrovent]	Wed Jul 17 2002	Sat Jul 17 2004	
Acetaminophen 24 MG/ML / Codeine Phosphate 2.4 MG/ML Oral Solution	Thu Aug 27 2009	Sat Aug 27 2011	
Cyclobenzaprine hydrochloride 10 MG	Thu Aug 27 2009	Sat Aug 27 2011	

Bottom Panel:

- Plugins:** A section showing installed plugins. The "SMART Dashboard" plugin is highlighted, with a description: "This plugin enables you to run SMART (Substitutable Medical Apps, reusable technologies) applications within the i2b2 web client." Another plugin, "Example #1 - Hello World", is also listed.

Message Architecture: SMART i2b2 Cell (REST & OAuth)



Navigate Terms

Find Terms

- Visit Details
- Procedures
- Custom Metadata
- Expression Profiles Data
- Medications
- Clinical Trials
- Diagnoses
- Reports
- Demographics
- Laboratory Tests
- Providers

Workplace

- i2b2 Patients
 - 1000000008 [23 y/o M hispanic]
 - 1000000059 [35 y/o M hispanic]
 - PATIENT:1000000001
 - PATIENT:1000000002
 - PATIENT:1000000003
 - PATIENT:1000000004
 - PATIENT:1000000005
 - PATIENT:1000000006
 - PATIENT:1000000007
 - PATIENT:1000000008
 - PATIENT:1000000009
 - PATIENT:1000000010
 - PATIENT:1000000011
 - PATIENT:1000000012
 - PATIENT:1000000013

Previous Queries

- CT Re- 35--Appen@16:27:27 [6-10-2011] [i2b2]
- 18-34-Female@16:21:04 [5-26-2011] [i2b2]
- Clove@02:25:41 [5-14-2011] [i2b2]
- Clove@18:57:20 [5-9-2011] [i2b2]
- Cerebrovascular@17:40:45 [4-21-2011] [i2b2]
- Hypert-Prongk@20:30:12 [4-4-2011] [i2b2]

SMART Dashboard

Step 1. Drag a patient to box below:
 1000000008 [23 y/o M hispanic]

Step 2. Choose a SMART App below:

Med List
 Med Calendar Got
 Statins?
 Problems
 Cardiac Risk
 Local App



Bloodwork Cardiology Result

Note: these results are valid for non-diabetics

Patient info

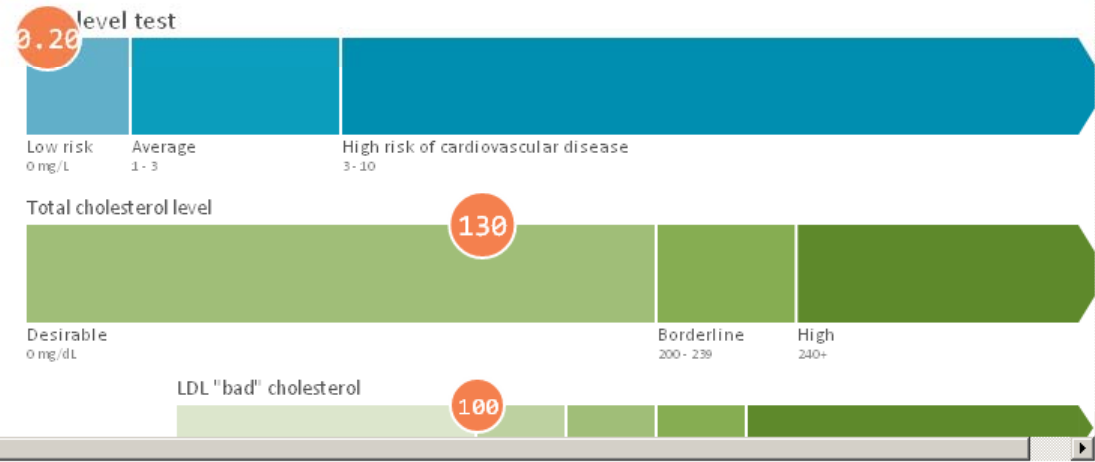
NAME: i2b2 Patient Num 1000000008
 GENDER: M AGE: 45 DOB: 1986-12-16

- Current smoker?
- Family history of heart attack?
- Systolic blood pressure

1 About this test

This report evaluates your potential risk of heart disease, heart attack, and stroke.

2 Your Results



Plugins

Detailed List View

Category: ALL



SMART Dashboard

This plugin enables you to run SMART (Substitutable Medical Apps, reusable technologies) applications within the i2b2 web client.

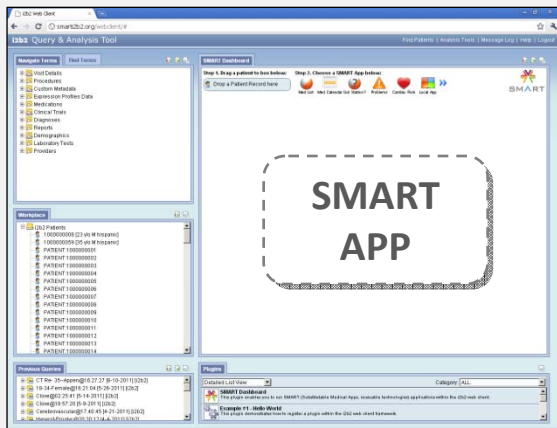


Example #1 - Hello World

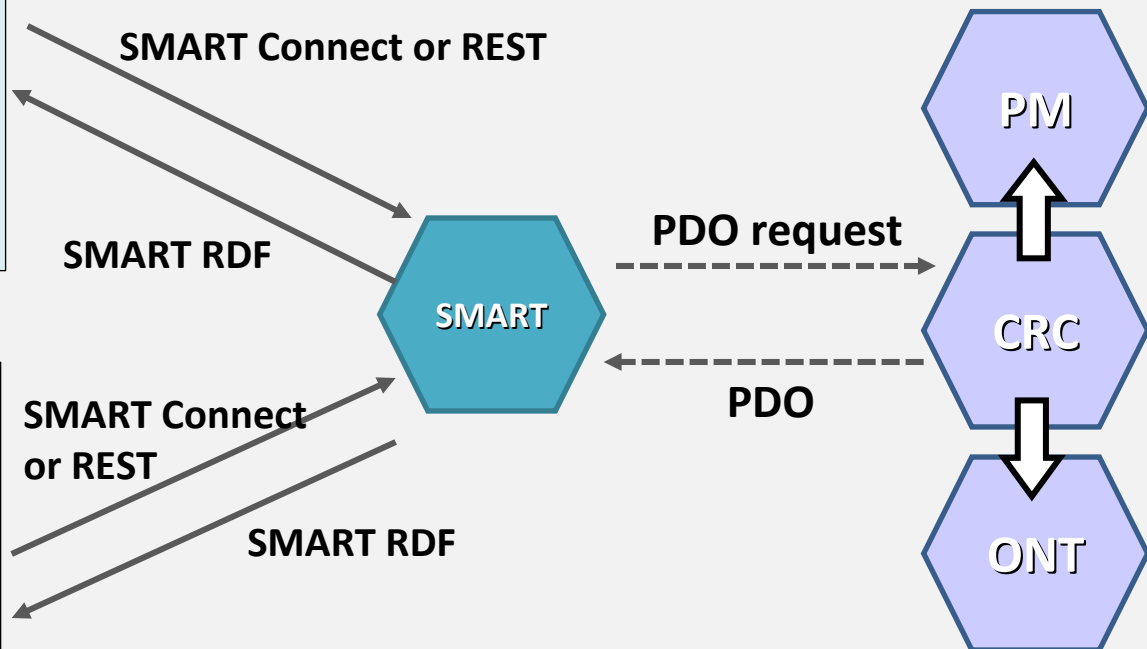
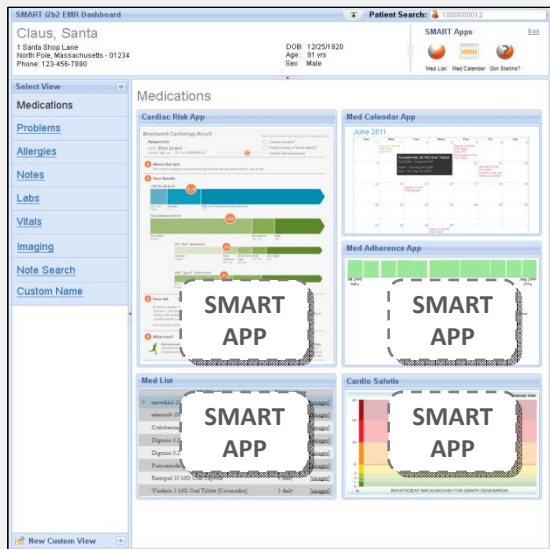
This plugin demonstrates how to register a plugin within the i2b2 web client framework.

Client can be optimized for EMR-View of patient

i2b2 web client



SMART EMR-View client



The job of the SMART cell is to do most of the heavy lifting to convert SMART queries into serviceable i2b2 queries and convert i2b2 responses to SMART RDF responses that can be consumed by the SMART apps.

Layout of editable EMR-Screen

SMART i2b2 EMR Dashboard

Patient Search: 100000012

Claus, Santa
 1 Santa Shop Lane
 North Pole, Massachusetts - 01234
 Phone: 123-456-7890

DOB: 12/25/1920
 Age: 91 yrs
 Sex: Male

SMART Apps Drag and Drop an app below

Med List Med Calendar Got Statins? Problems Cardio Risk Local App Allergies Med Risks

Select View

- Medications
- Problems
- Allergies
- Notes
- Labs
- Vitals
- Imaging
- Note Search
- Custom Name

Medications Change View

Cardiac Risk App

Bloodwork Cardiology Result

Patient info
 Alex Lewis
 12/25/1920

1 About this test
 This report includes your potential risk of heart disease, heart attack, and stroke.

2 Your Results

• ECG level test
 Low risk (0-2) High risk of cardiovascular disease (3-5)

Total cholesterol level
 143 mg/dL

LDL "bad" cholesterol
 30 mg/dL

HDL "good" cholesterol
 34 mg/dL

3 Your risk
 You show an elevated risk of cardiovascular disease.

12% Your risk would be lowered for:
 If you're a smoker with normal blood pressure, LDL levels, and family history of heart attack before the age of 50, or if both parents had heart disease over 50 years old, then your total results to calculate your risk of a cardiovascular event at [Foxvalldiabetes.org](#).

4 What now?
 Diet and exercise can improve your cholesterol level.
 Staying smoke free is one of the best ways to improve your heart disease risk.
 Ask your doctor about taking or other medications that can lower cholesterol.
 Consider asking your doctor to check a heart rate monitor.

Med Calendar App

June 2011

Med Adherence App

carvedilol Adherence: Good
 94% (Jan 2008) - 95% (Aug 2009)

Chronic Meds
 Understanding the diagnosis:
 Light green: medication possession
 Bright green: early fulfillment
 White: gaps in possession

Med Adherence App

carvedilol Adherence: Good
 94% (Jan 2008) - 95% (Aug 2009)

Chronic Meds
 Understanding the diagnosis:
 Light green: medication possession
 Bright green: early fulfillment
 White: gaps in possession

San Diego: simulated 100%

New Custom View

Layout of locked EMR Screen

SMART i2b2 EMR Dashboard Patient Search: 1000000012

Claus, Santa
 1 Santa Shop Lane
 North Pole, Massachusetts - 01234
 Phone: 123-456-7890

DOB: 12/25/1920
 Age: 91 yrs
 Sex: Male

Insurance: SELF PAY
 Policy #: [Show]
 Advanced:

Guarantor: Doe, John
 123 First Avenue
 Boston, Massachusetts 02114

[Edit Apps](#)

Select View <<

- Medications
- Problems
- Allergies
- Notes
- Labs
- Vitals
- Imaging
- Note Search
- Custom Name

Medications

Cardiac Risk App

Bloodwork Cardiology Result

Patient info: Alex Lewis
 SSN: M 123 456 7890

Current smoker?
 Family history of heart attack?
 Synthetic blood products

About this test
 This report evaluates your potential risk of heart disease, heart attack, and stroke.

Your Results

CRP level test
 CRP level test: 2.4 (High risk of cardiovascular disease)

Total cholesterol level
 Total cholesterol level: 145 (High)

LDL "bad" cholesterol
 LDL "bad" cholesterol: 85 (High)

HDL "good" cholesterol
 HDL "good" cholesterol: 35 (Low)

Your risk
 You show an elevated risk of cardiovascular disease. **12%** Your risk would be lowered to 2% if you checked boxes on 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

What now?
 Diet and exercise: Stay healthy and active.
 Staying smoke-free: Stay smoke-free to reduce your heart disease risk.
 Ask your doctor: Ask your doctor about statins or other medications that can lower cholesterol.
 Consider enrolling: Consider enrolling in a 12-week lifestyle program to reduce your risk of heart disease.

Med List

Medication	Instructions
> carvedilol 25 MG Oral Tablet	1 daily [images]
celecoxib 200 MG Oral Capsule [Celebrex]	1 daily [images]
Cydoenzapine hydrochloride 10 MG Oral Tablet	1 tid pen [images]
Digoxin 0.25 MG Oral Tablet	1 daily [images]
Digoxin 0.25 MG Oral Tablet [Lanoxin]	1 daily [images]
Furosemide 20 MG Oral Tablet	1 daily [images]
Ramipril 10 MG Oral Capsule	1 daily [images]
Warfarin 5 MG Oral Tablet [Coumadin]	1 daily [images]

Med Calendar App

June 2011

Carvedilol 25 MG Oral Tablet [images]

Med Adherence App

carvedilol Adherence: Good

Chronic Meds

Understanding the diagram:
 Light green: medication processes
 Bright green: early Adherence
 Yellow: gaps in processes
 Blue highlight: cumulative MPR

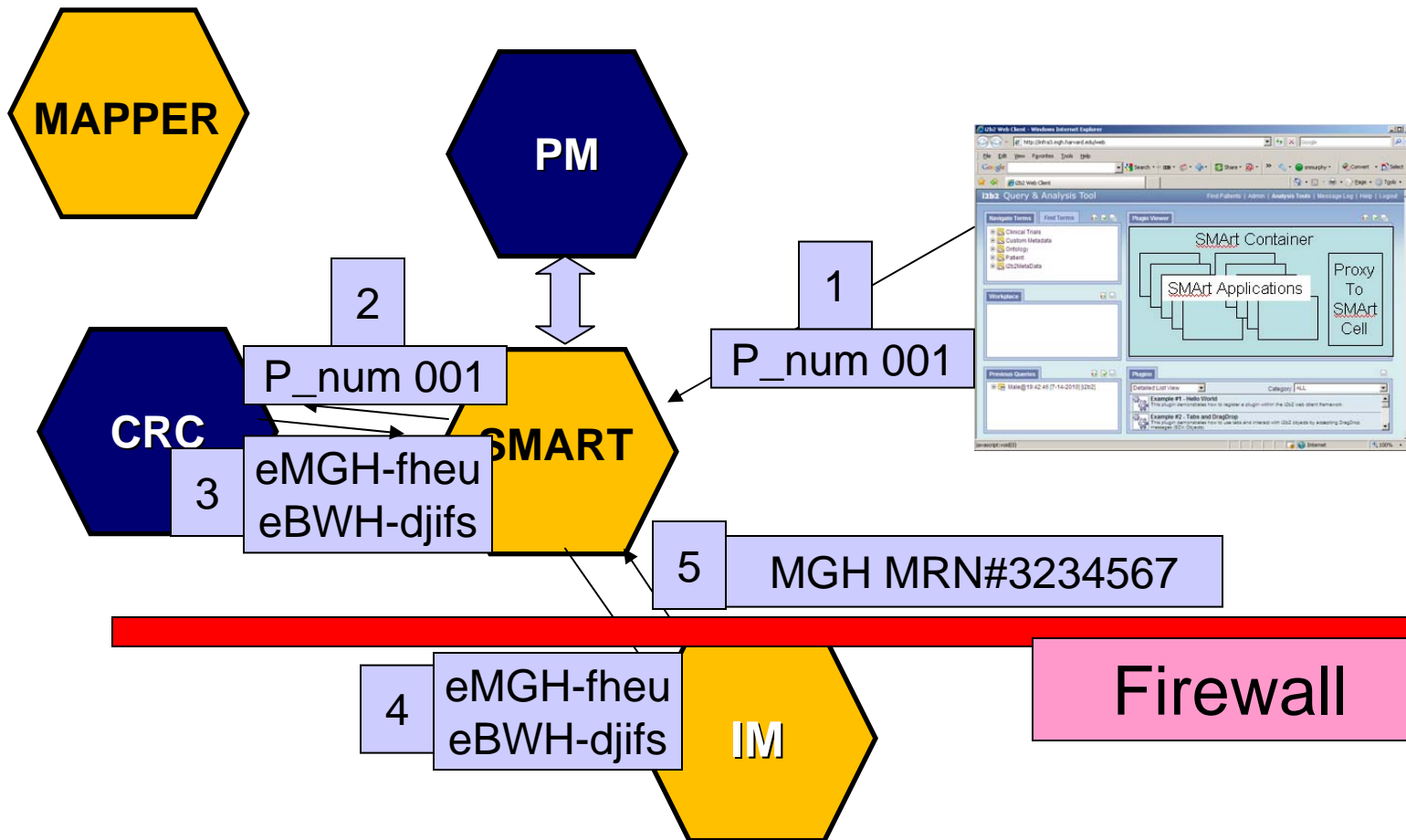
Cardio Salus

CARDIOVASCULAR DISEASE RISK

INSUFFICIENT BACKGROUND FOR GRAPH GENERATION

New Custom View

Flow for conversion of patient_num to MDR



IM Cell

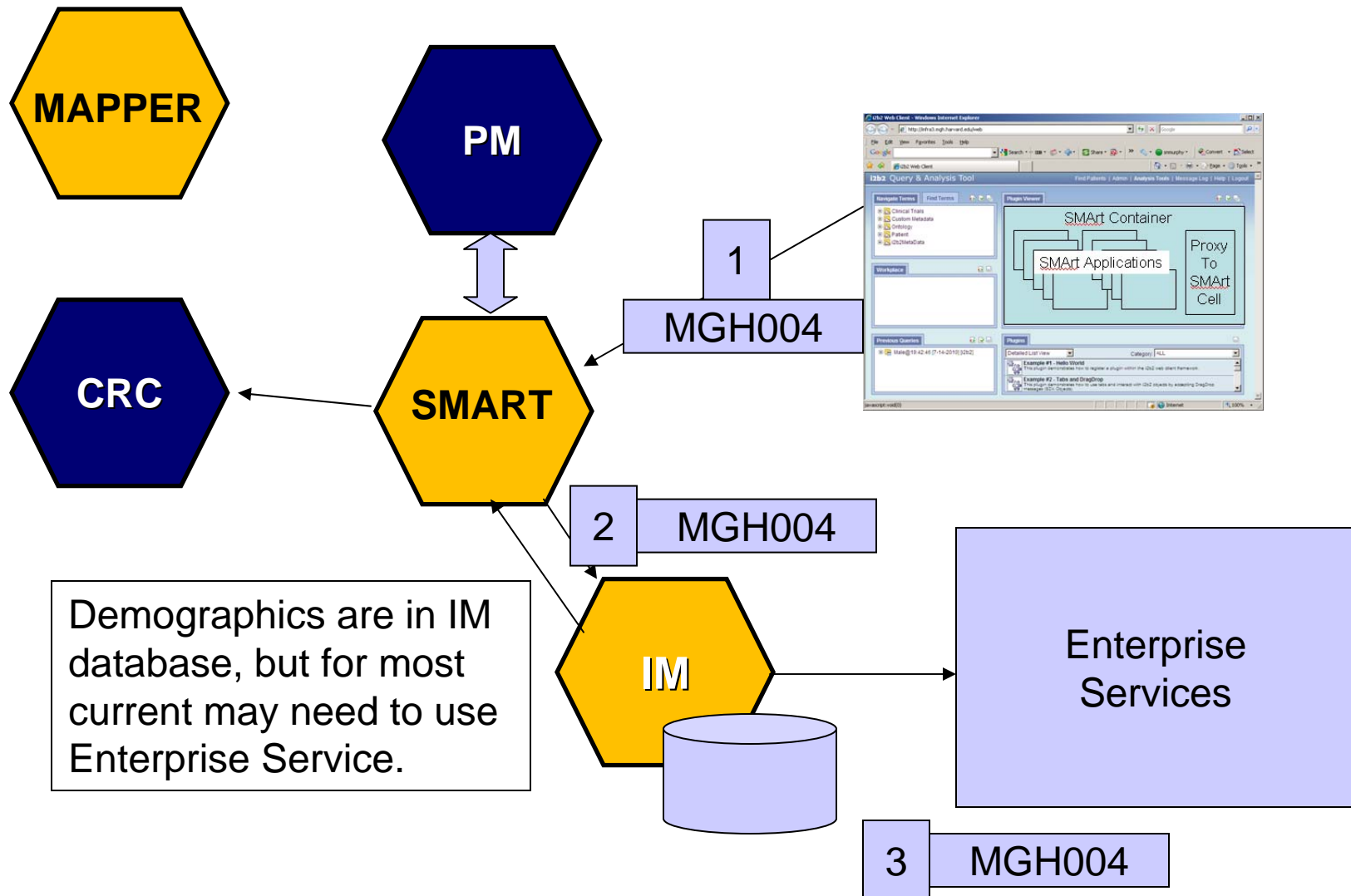
■ Main functions

- Converts MRNs to i2b2 patient nums
- Holds demographics in tables which do not contain clinical data
- Links to enterprise services and converts custom enterprise output to i2b2 standards
- Lists of patients with real identifiers are managed and linked to a project

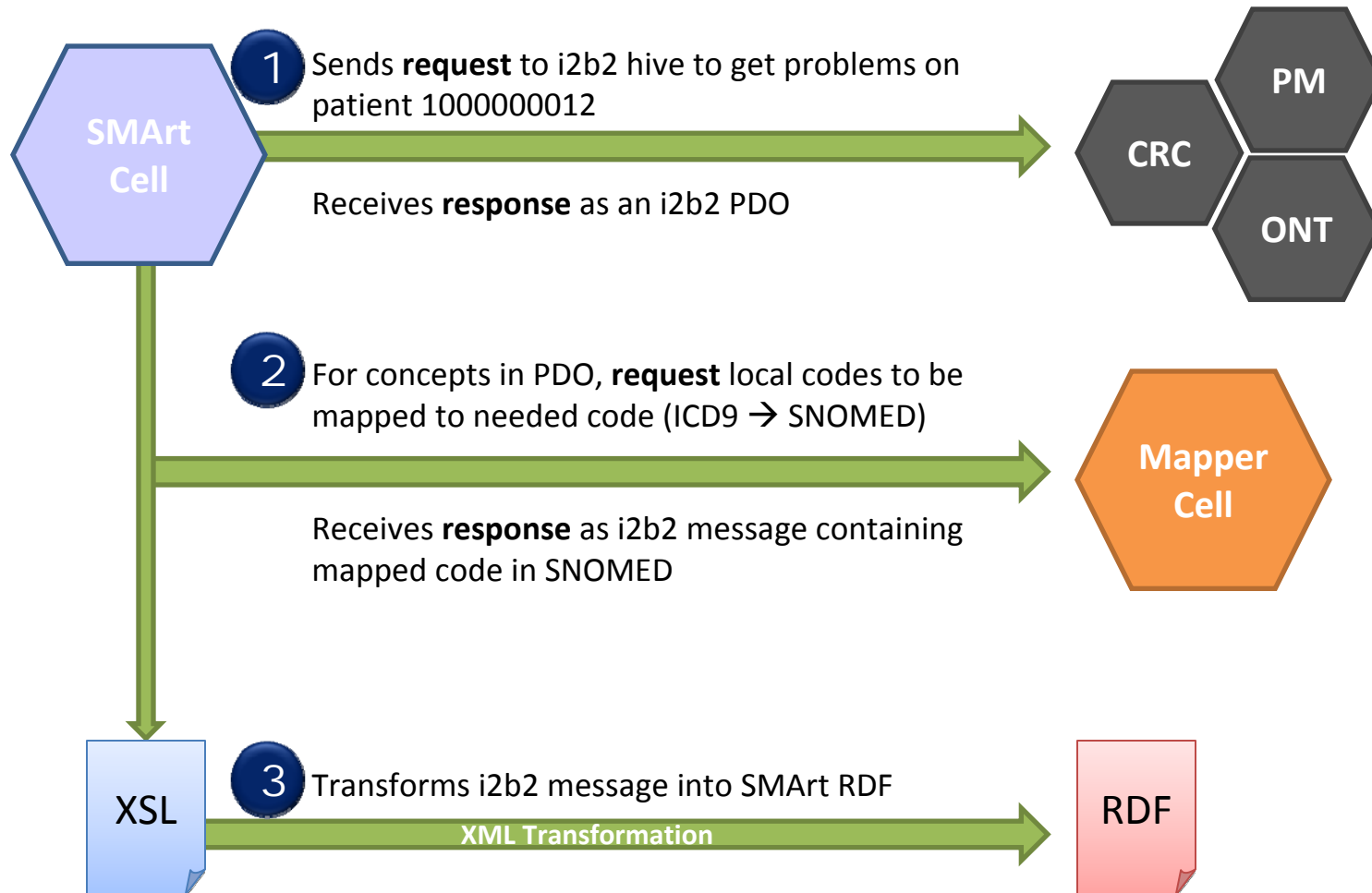
Contact data through IM Cell

- Links to enterprise services and converts custom enterprise output to i2b2 standards
 - Request for demographics is sent to IM cell
 - If using i2b2 number converts to MRN
 - Depending on implementation
 - Demographics requested from services = most up to date
 - Demographics requested from database
 - Demographics sent back in PDO

Flow for getting demographics



Mapper Cell



Messages

1. An individual's problems as represented in an i2b2 XML message:

```
- <ns2:concept_set>
- <concept>
  <concept_path>\i2b2\Diagnoses\Circulatory system (390-459)\Hypertensive disease (401-405)\(401)
  Essential hypertension\ (401-9) Unspecified essential hyp~\</concept_path>
  <concept_cd>ICD9:401.9</concept_cd>
  <name_char>Huchard's disease</name_char>
</concept>
- <concept>
  <concept_path>\i2b2\Diagnoses\Digestive system (520-579)\Oral cavity diseases (520-529)\(523)
  Gingival and periodontal di~\ (523-6) Accretions on teeth\</concept_path>
  <concept_cd>ICD9:523.6</concept_cd>
  <name_char>Dental plaque</name_char>
</concept>
- <concept>
  <concept_path>\i2b2\Diagnoses\Digestive system (520-579)\Oral cavity diseases (520-529)\(523)
  Gingival and periodontal di~\ (523-9) Unspecified gingival and ~\</concept_path>
  <concept_cd>ICD9:523.9</concept_cd>
  <name_char>Unspecified gingival and periodontal disease</name_char>
</concept>
- <concept>
  <concept_path>\i2b2\Diagnoses\Genitourinary system (580-629)\Nephritis, nephrotic syndrome, and
  nephrosis (580-589)\(585) Chronic renal failure\</concept_path>
  <concept_cd>ICD9:585</concept_cd>
  <name_char>Chronic renal failure</name_char>
</concept>
```



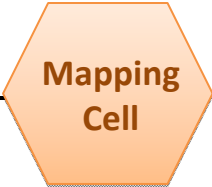
Ontology
Cell

Case: We require diagnoses to be coded in SNOMED, but we only have ICD9 codes.

Action: Send an XML request to the Mapping Cell with the desired ICD9's (above) to be mapped to SNOMED (e.g. ICD9: 401.9)

2. Response from Mapping Cell contains SNOMED codes and names:

```
- <mapped_concept_set>
- <mapping>
  <source_coding_system>ICD9</source_coding_system>
  <source_basecode>401.9</source_basecode>
  <destination_coding_system>SNO</destination_coding_system>
  <destination_basecode>38341003</destination_basecode>
  <destination_name>Hypertensive disorder, systemic arterial (disorder)</destination_name>
</mapping>
- <mapping>
  <source_coding_system>ICD9</source_coding_system>
  <source_basecode>523.6</source_basecode>
  <destination_coding_system>SNO</destination_coding_system>
  <destination_basecode>17552000</destination_basecode>
  <destination_name>Dental calculus (disorder)</destination_name>
</mapping>
- <mapping>
  <source_coding_system>ICD9</source_coding_system>
  <source_basecode>523.9</source_basecode>
  <destination_coding_system>SNO</destination_coding_system>
  <destination_basecode>2556008</destination_basecode>
  <destination_name>Periodontal disease (disorder)</destination_name>
</mapping>
- <mapping>
  <source_coding_system>ICD9</source_coding_system>
  <source_basecode>585</source_basecode>
  <destination_coding_system>SNO</destination_coding_system>
  <destination_basecode>90688005</destination_basecode>
  <destination_name>Chronic renal failure syndrome (disorder)</destination_name>
</mapping>
```

A hexagonal orange icon with the text "Mapping Cell" inside.

The mapping cell returned the mappings for the ICD9's sent from the previous slide (e.g. SNOMED of **38341003** mapped to ICD9: 401.9)

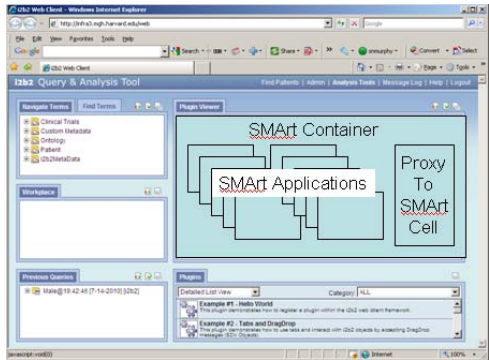
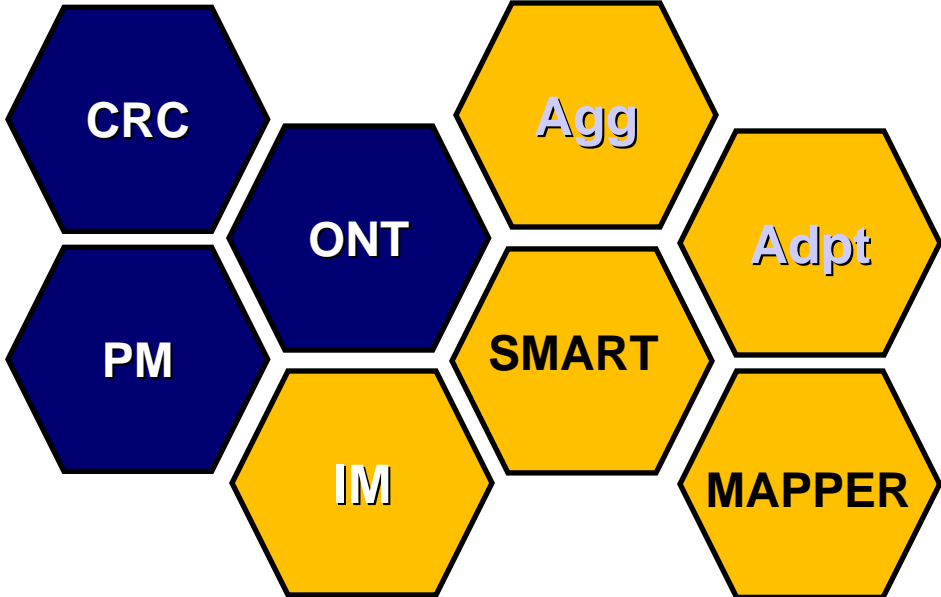
3. i2b2 “Mapped PDO” is transformed into RDF in SMArt Cell

```
- <sp:Problem>
- <sp:problemName>
- <sp:CodedValue>
  <sp:code rdf:resource="http://www.ihtsdo.org/snomed-ct/concepts/38341003/" />
  <dcterms:title>Hypertensive disorder, systemic arterial (disorder)</dcterms:title>
- <sp:codeProvenance>
  - <sp:CodeProvenance>
    <sp:sourceCode rdf:resource="http://smart.i2b2.org/concepts/code#ICD9:401.9" />
    <dcterms:title>Huchard's disease</dcterms:title>
    <sp:translationFidelity rdf:resource="http://smartplatforms.org/terms/code/fidelity#automated" />
  </sp:CodeProvenance>
</sp:codeProvenance>
</sp:CodedValue>
</sp:problemName>
<sp:onset>2005-10-31</sp:onset>
<sp:resolution>2007-10-31</sp:resolution>
</sp:Problem>
```



SMArt
Cell

Work to be done on Components



Enterprise Services

THANK YOU - URL's

- <http://smarti2b2.org/webclient/>
 - [HTML5 = IE8+, Firefox3+, Chrome]
- http://wiki.chip.org/smart-project/index.php/Main_Page
- <http://www.smartplatforms.org/>