The Office of the National Coordinator for Health Information Technology

Data Access Framework (DAF)

All Hands Community Meeting

November 30, 2016

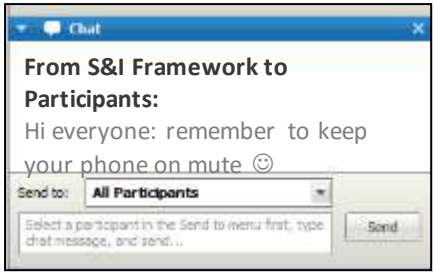
Meeting Etiquette

- If you are not speaking, please keep your phone on mute

- DO NOT place your phone on hold, if you need to take another call or step away, please hang up and dial in again
  - » Hold = Elevator Music = Challenge for Speakers and Participants

- This meeting is being recorded and will be archived on the DAF Wikipage, under "DAF Materials" → "DAF Past Meetings"

- Feel free to use the "Chat" feature for any questions, comments or any items you would like the moderator or participants to know



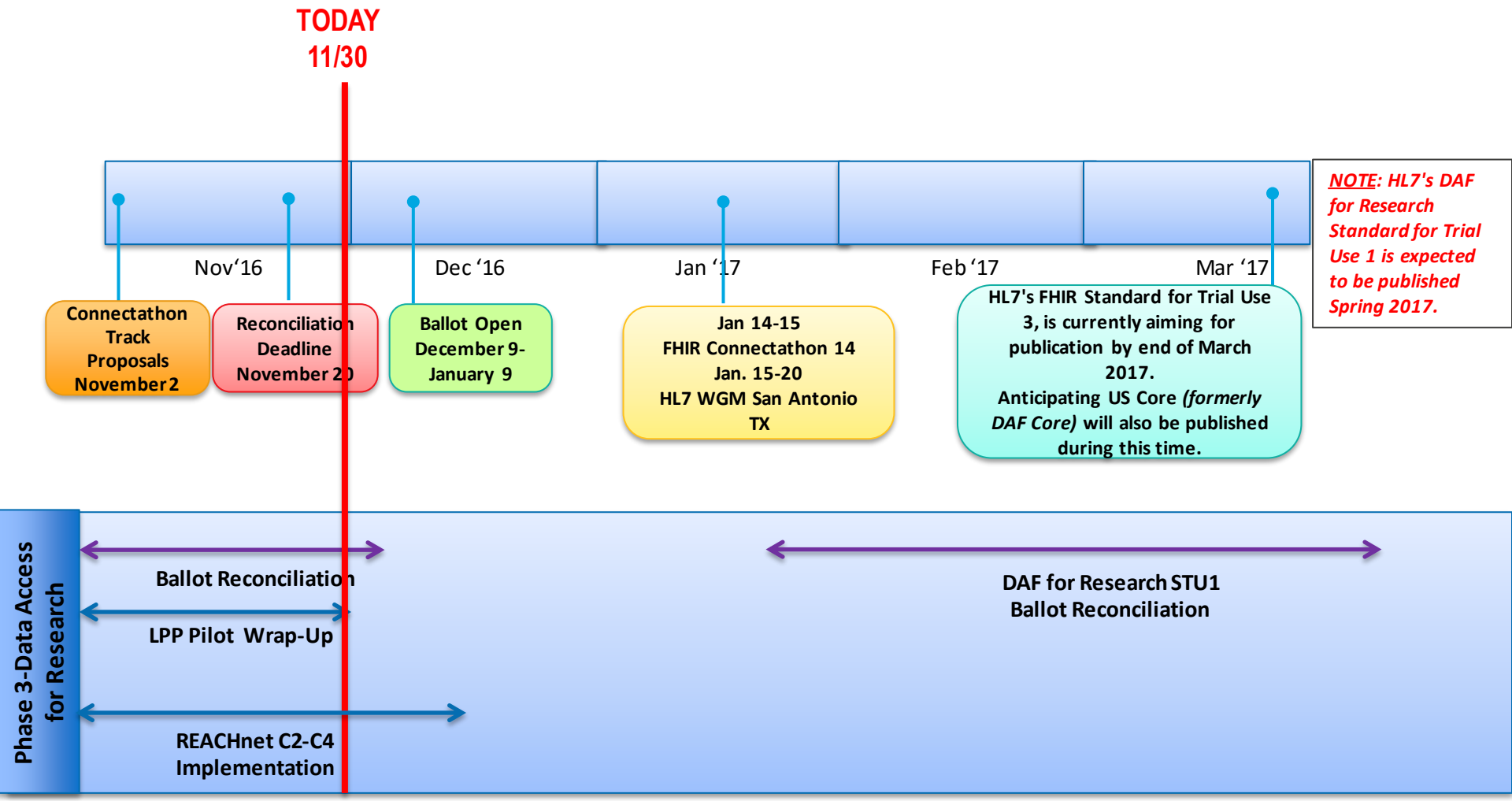
Agenda

Topic	Estimated Time
General Announcements	2 minutes
HL7 Ballot Updates	10 minutes
Lincoln Peak: Pilot Report-Out	40 minutes
Next Steps & Questions	2 minutes

General Announcements

- **DAF All Hands Community Meeting**
  - Our next All Hands meeting will be on **Wednesday, December 14, 2016 at 12:00 PM (ET).** The meeting details can be accessed on the homepage: https://oncprojectracking.healthit.gov/wiki/display/TechLabSC/DAF+Home
- **DAF Pilot Wikipage**
  - To track the latest Phase 3 pilot activities, please visit: https://oncprojectracking.healthit.gov/wiki/display/TechLabSC/DAF+Pilots
- **Past Meeting Materials**
  - To access materials and meeting recordings from the All Hands meetings and technical WG calls, please visit: https://oncprojectracking.healthit.gov/wiki/display/TechLabSC/DAF+Past+Meetings

Notional Timeline



C5 and C6 are deferred until C1-C4 pilot activities have been sufficiently completed.

DAF HL7 September Ballot Descriptions

1. ***HL7 FHIR® IG: Data Access Framework (DAF), Release 1 (PI ID: 1265)***
   - Ballot reconciliation started at the WGM and will be ongoing via HL7 InM WG meetings.
     - 105 comments have be voted on successfully
     - ~14 comments left to be reconciled
     - Next Steps:
       - **To allow for continued ballot comment disposition and voting, publication of FHIR STU3 has been delayed and is now targeting March 2017**
   - Ballot Voting Results:
     - **Affirmative: 27**
     - **Negative: 53**
     - **Comments: ~119**
   - **The name of the IG has been renamed to **US Core IG.** It was updated to be able to clearly identify the core profiles that US implementations should support. It was approved by HL7 US Realm Steering Committee on Thursday 9/22 at the WGM in Baltimore, MD.

2. ***HL7 FHIR® IG: Data Access Framework (DAF) Research, Release 1 (1st Comment-Only Ballot) (PI ID: 1265)***
   - » Ballot reconciliation is underway working with FHIR Infrastructure (Sponsor) and RCRIM (Co-Sponsor) to reconcile comments and complete block voting
   - » RCRIM approved resources and made a few changes to the Scope section on DAF Research PSS on 11/22
   - » Ballot Voting Results:
     - – **Affirmative: 27**
     - – **Negative: 30**
     - – **Comments: ~90**
   - » Notice of Intent to Ballot (NIB) was submitted and approved by FHIR Infrastructure (Sponsor) on 10/17 for January Ballot Cycle
     - – DAF Research IG will go from Comment-Only Ballot to Standard for Trial Use (STU) Ballot
   - » Next Steps/Deadlines:
     - – **Final Content due Sunday: 12/4**
     - – **Ballot Pool Sign Up: 11/7- 12/8**
     - – **Ballot Opens: 12/9- 1/9/17**
     - – **January WGM (San Antonio, TX): 1/14/17- 1/20/17**

Preparing for DAF HL7 January 2017 Ballot Cycle

- **HL7 January Ballot Cycle Pool Sign-up**
  - » We encourage DAF community members, that are also current HL7 members, to please sign-up for the DAF consensus or review group for the **DAF Research IG STU 1** now through **Thursday, December 8th**
    - **NOTE:** This deadline also applies to non-members who wish to sign up for non-member participation in a ballot cycle
  - » **Ballot Pool Sign-Up:** http://www.hl7.org/ctl.cfm?action=ballots.loginchoice
  - » **Ballot instructions:** http://www.hl7.org/participate/onlineballoting.cfm?ref=nav
  - » Voting and comments are open during the ballot comment period **from December 9th through January 9th**

Lincoln Peak
Pilot Report-Out

Agenda

- Pilot Background
- Accomplishments
- Lessons Learned
- Ideas for Path Forward
- Questions

Background

Pilot Goal

Goal

DAF Phase 3 (data access for research) aims to enable researchers to access data from multiple organizations and data sources within a Learning Health System (LHS) infrastructure.

Use Cases

Demonstrate the utility of the DAF-Research IG by implementing it's capabilities in the PopMedNet™ (PMN) Distributed Research Network system.

1. (C2) Provide mechanism for DataMarts to publish their DAF-Research Metadata through PMN.
2. (C2/C3) Provide visibility of DataMart Metadata to researcher in the PMN Query Composer.
3. (C3) Allow the PMN Query Composer to transmit queries using the DAF-Research resources
4. (C3/C4) Allow the PMN DataMart client to retrieve and respond to queries using the DAF-Research resources
5. (C4) Allow the PMN Query Composer to receive and display query results using the DAF-Research resources

Pilot Goal

Drivers

- Provide the discovery and capabilities of new data sources through standardized RESTful resources.
- Promote adoption of standardized RESTful resources by research networks.
- Demonstrate the capabilities of PopMedNet™ using the DAF-Research resources for distributed research networks.
- Reduce barriers and minimize cost to onboarding organizations' DataMarts by standardizing API and data mappings from EHR systems to "research ready" data store.

Pilot Team

Pilot Team

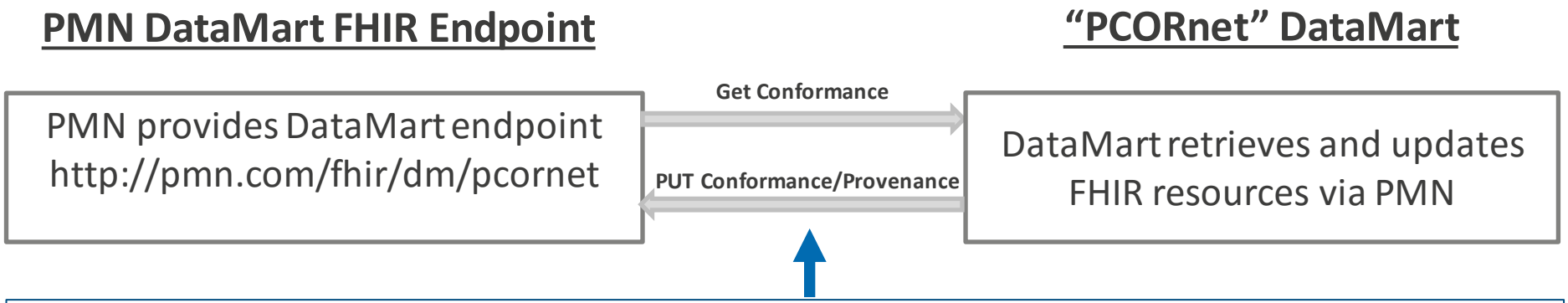
- Bill Clarke (Team Lead, Lincoln Peak)
- Bruce Swan (Team Advisor, Lincoln Peak)
- Daniel Dee (Development Manager, Lincoln Peak)
- Salman Khalid (Lead Developer, Lincoln Peak)
- Glen Balastrieri (Managed Services, Lincoln Peak)

Accomplishments

C2 Capabilities

C2-1	Data Mart Metadata SHALL be defined to identify the characteristics of the Data Mart population.
C2-2	Data Mart Metadata SHALL be defined to facilitate verification of data loading from Data Sources.
C2-3	Data Marts SHALL populate a Data Mart Metadata resource based on the data loaded from the Data Source.
C2-4	Data Mart Metadata SHALL NOT contain any PII or PHI information.
C2-5	Data Mart Metadata SHALL be exposed via RESTful APIs.
C2-6	Data Mart Metadata SHALL be capable of tracking changes across data loading activities.
C2-7	Query Composer may access Data Mart Metadata Resource to inform query composition.

C2 Implementation Overview



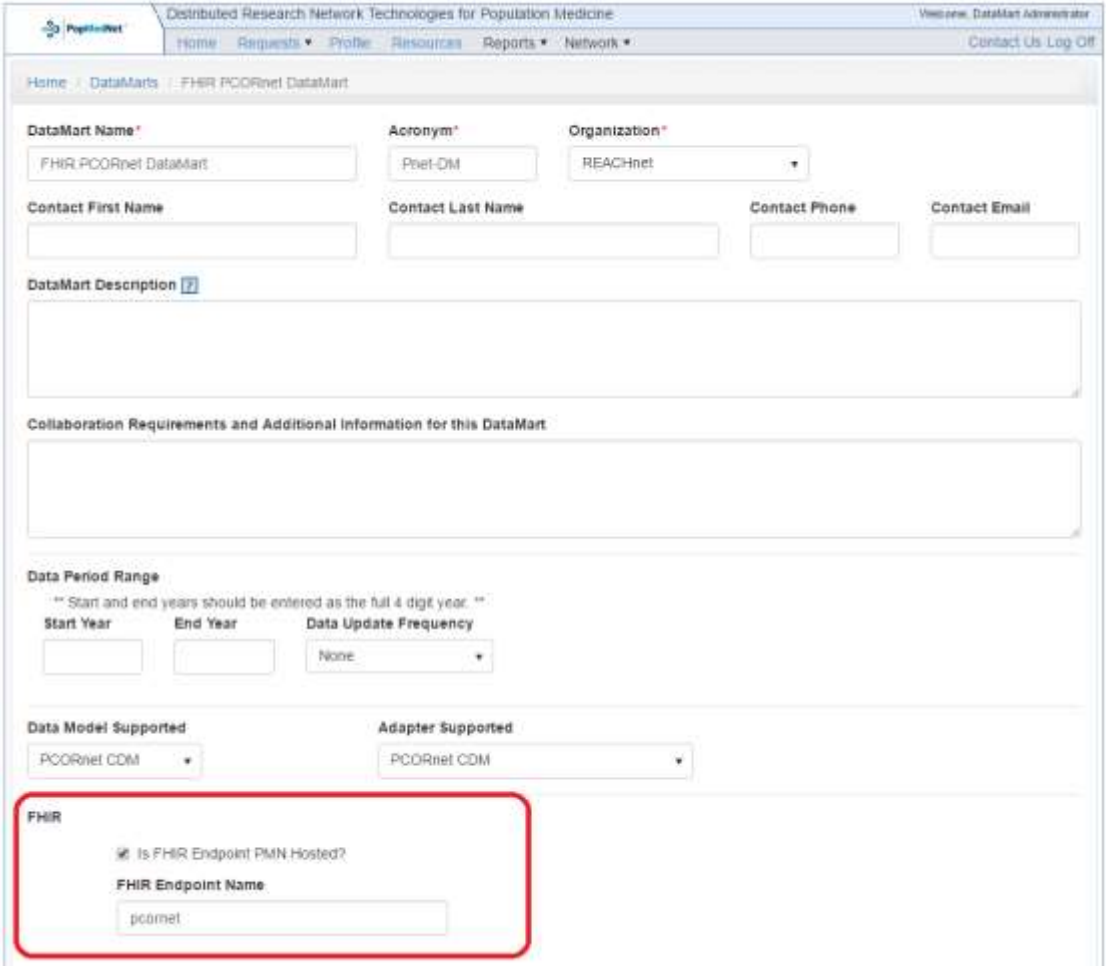
1. PMN provides a configuration setup for FHIR DataMart endpoint
2. After loading data, the DataMart will use PMN endpoint to get current Conformance resource.
3. The DataMart updates it's Conformance resource back to PMN using: **http://pmn.com/fhir/dm/pcornet/conformance**
4. The DataMart adds a new Provenance resource into PMN using : **http://pmn.com/fhir/dm/pcornet/provenance**

PMN will store and serve these resources on behalf of the "PCORnet" DataMart

Note: In the above example "pcornet" is used as the name of the DataMart in PMN. This is just a sample DataMart name used for testing purposes.

C2 Capability – Configure DataMart

Step 1 – DataMart administrator configures the DataMart to have an FHIR Endpoint in PMN



C2 Capability – Update DataMart Metadata

Step 2 – DataMart maintains Conformance and Provenance Metadata as needed.

1. **HTTP GET http://pmn.com/fhir/dm/pcornet/conformance**

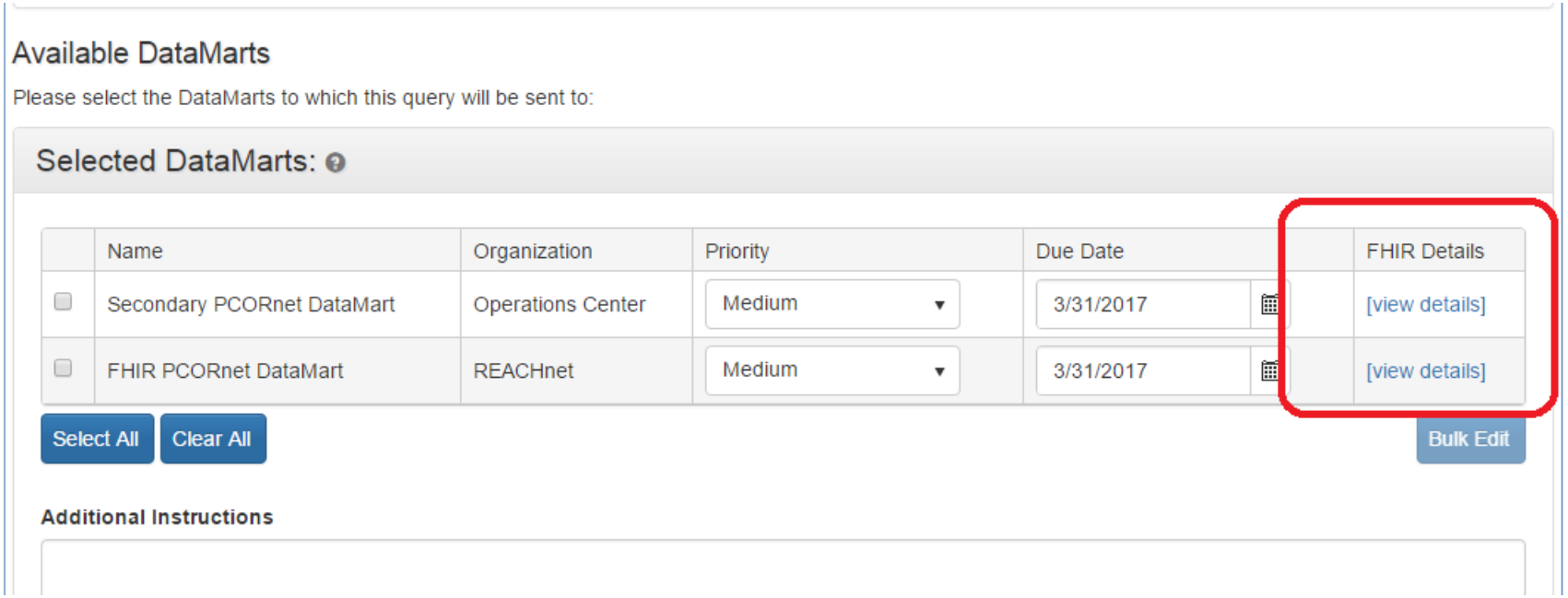
2. **HTTP PUT http://pmn.com/fhir/dm/pcornet/conformance**

3. **HTTP POST http://pmn.com/fhir/dm/pcornet/provenance**

Note: In the above example "pcornet" is used as the name of the DataMart in PMN. This is just a sample DataMart name used for testing purposes.

C2 Capability – Researcher View DataMart Metadata

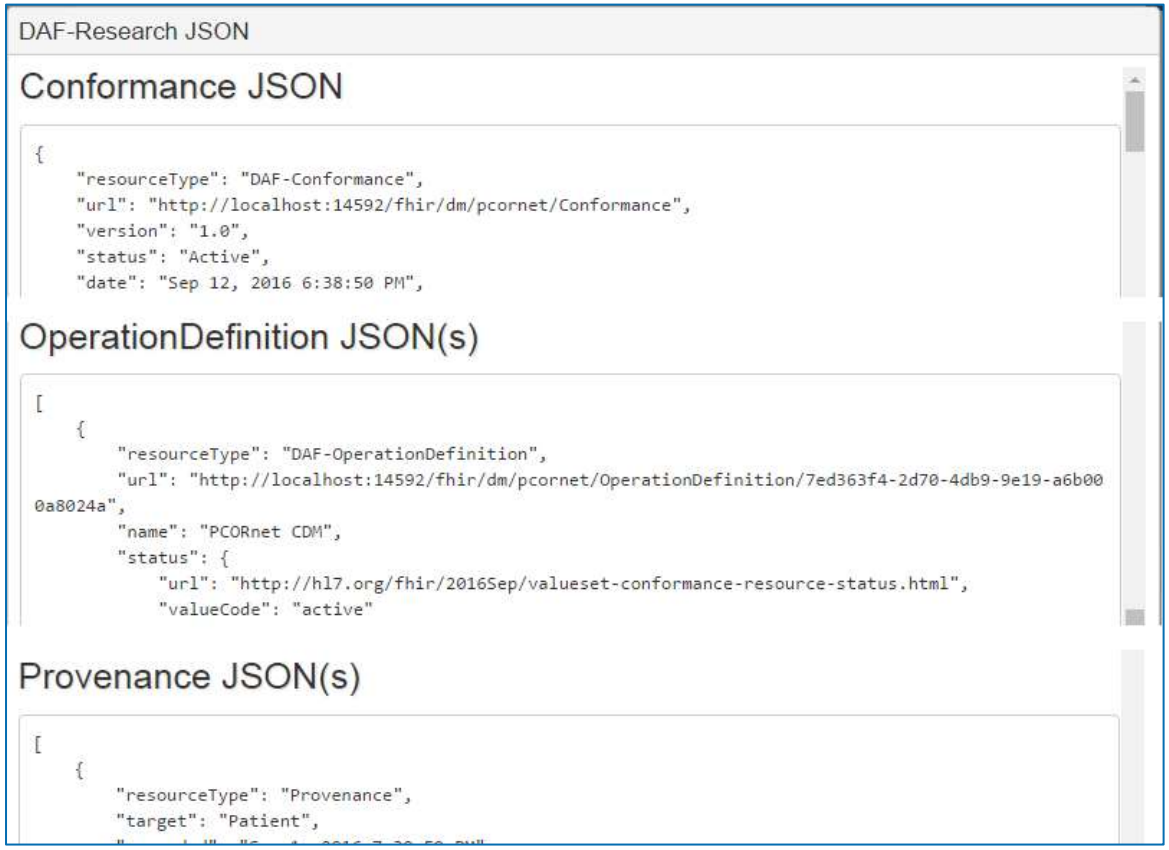
Step 3 – PMN provides researcher with the ability to view DAF Metadata on demand



Note: PMN uses the DAF Conformance and Provenance RESTful resources to retrieve the DataMart details that have been stored by the DataMart

C2 Capability – Researcher View DataMart Metadata

Step 4 – Researcher views DAF Metadata when deciding which DataMart to use for research



Note: A complete Conformance, OperationDefinition and Provenance example JSON is provided in a separate ZIP package.

C3 Capabilities

C3-1	Query Composer SHALL enable a researcher to compose a query based on the Data Mart Metadata.
C3-2	Query Composer SHALL define Query Metadata structure and semantics (query envelope) for each query to facilitate research workflows.
C3-3	Query Composer SHALL be capable of persisting queries for later recalls.
C3-4	Query Composer SHALL be capable of authorizing queries by organizations, by researchers, and other actors as appropriate.
C3-5	Query Composer SHALL expose the Queries created using RESTful APIs.
C3-6	Query Responder SHALL be able to receive the query from the Query Composer using RESTful APIs.
C3-7	Query Responder SHALL be capable of displaying the query for inspection prior to execution.
C3-8	Query Responder SHALL be capable of converting queries to other formats as needed to interact with the Data Marts.
C3-9	Query Responder SHALL provide the capability for Admins to inspect and authorize query results before returning it to the Query Composer.
C3-10	Query Responder SHALL be independent of the Data Models used by the Data Marts.
C3-11	Query Responder share be able to make results available to Query Responder using RESTful APIs.

C3 Implementation Overview

PMN Query Composer

Compose research query and submit to DataMarts. Expose query tasks via FHIR.

PMN FHIR endpoint:
http://pmn.com/fhir/task

Retrieve Queries

Create execution Task

PMN DataMart Client

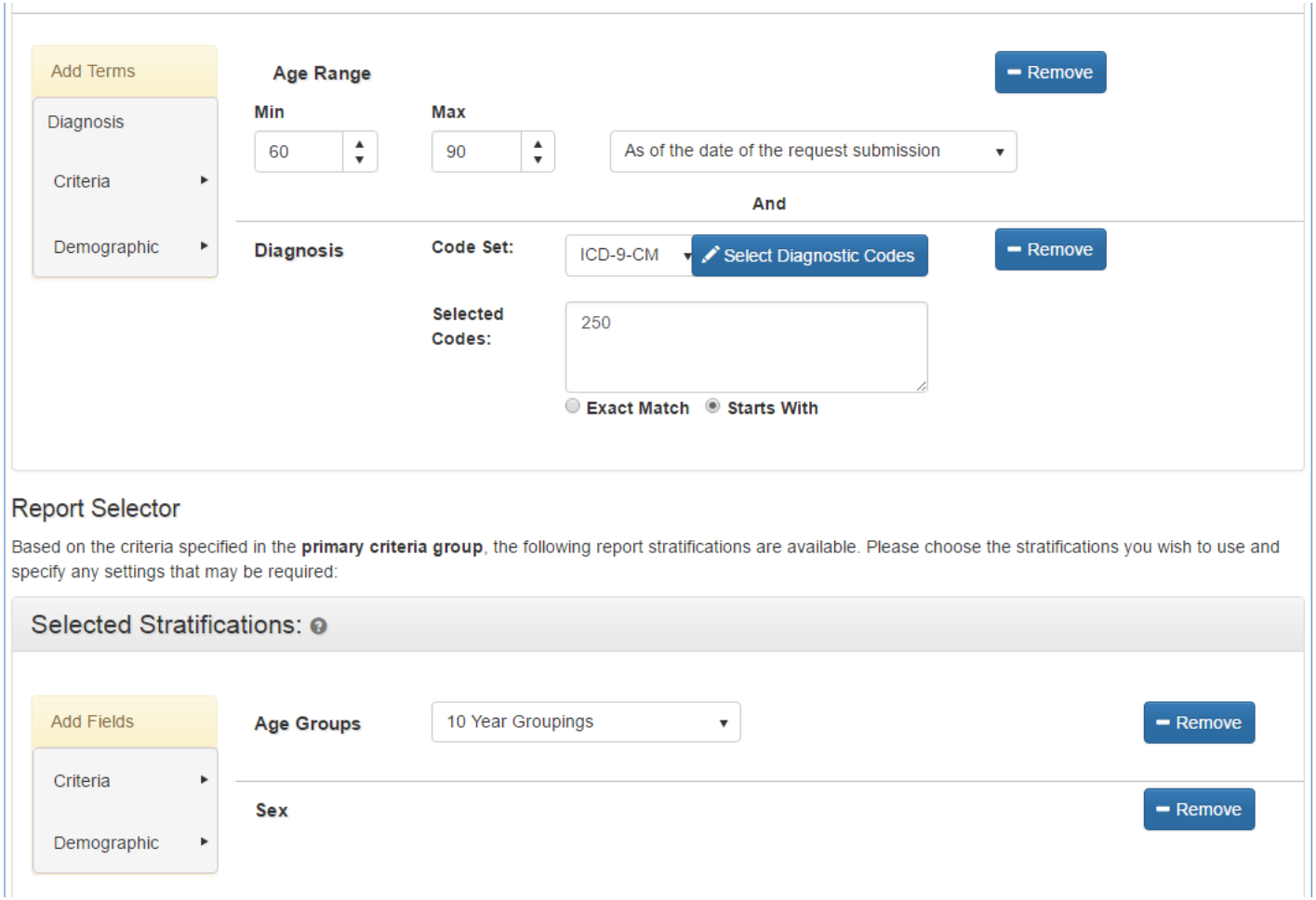
Get Task to execute and create a new Task instance for execution

1. PMN creates a research query using it's existing query composer
2. PMN distributes query using existing using existing method
3. PMN exposes main query and distributed queries using FHIR end-point:
   http://pmn.com/fhir/task/<pmn-giud-for-task>
4. DMC will retrieve it's research query tasks using FHIR end-point:
   http://pmn.com/fhir/task?_filter=(status eq 'requested') and top eq 50 and skip eq 0
   Or
   http://localhost:14592/fhir/task?owner=Device/<pmn-giud-for-datamart>
5. DMC will POST a new instance of Task using PMN FHIR end-point:
   http://pmn.com/fhir/task

Note: PMN will parse and store the FHIR requests, but will translate these requests into standard PMN structures.

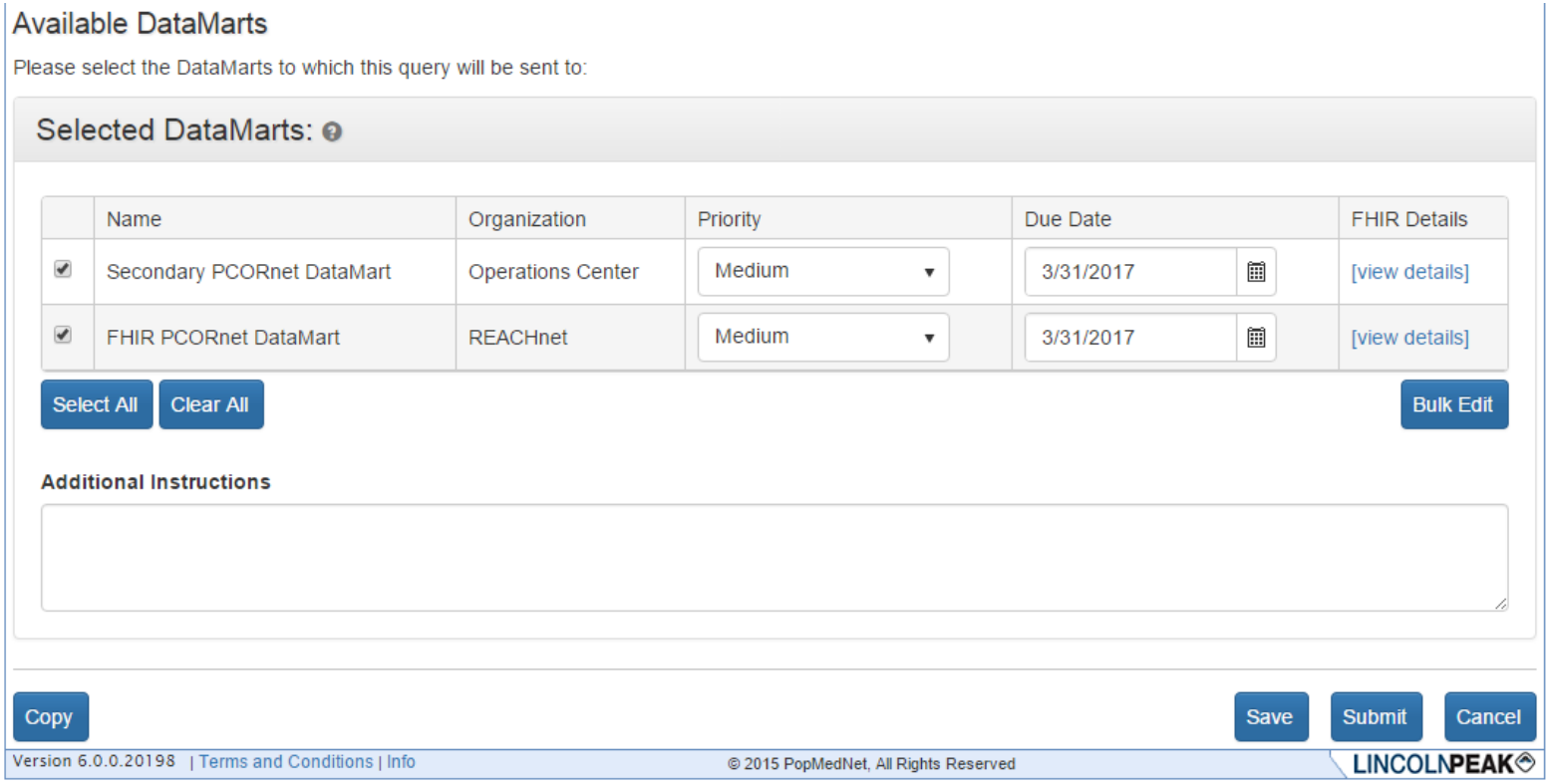
C3 Capability – Compose Query

Step 1 – Researcher uses PMN Query composer to construct aggregate query



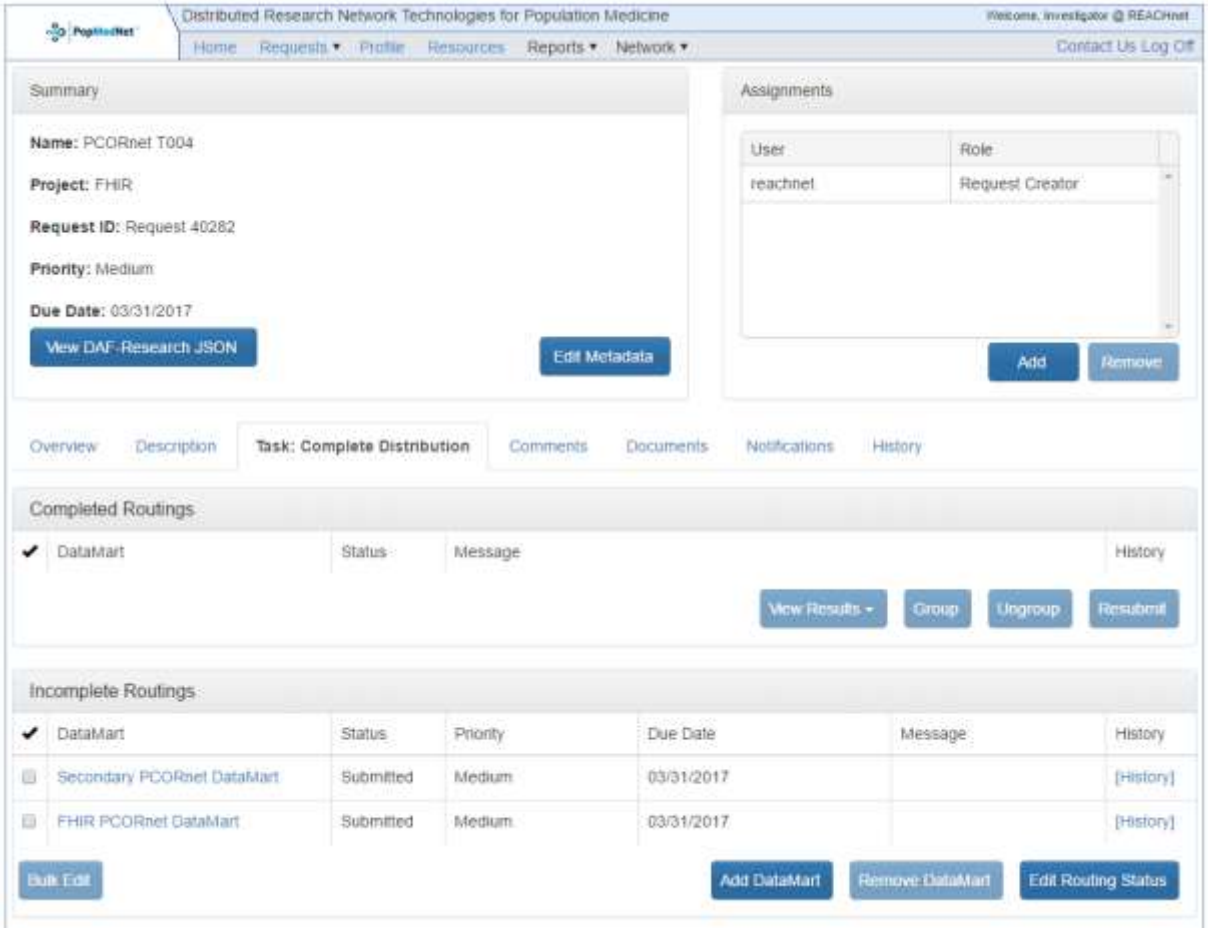
C3 Capability – Submit Query

Step 2 – Researcher selects DataMarts and submits the research Query



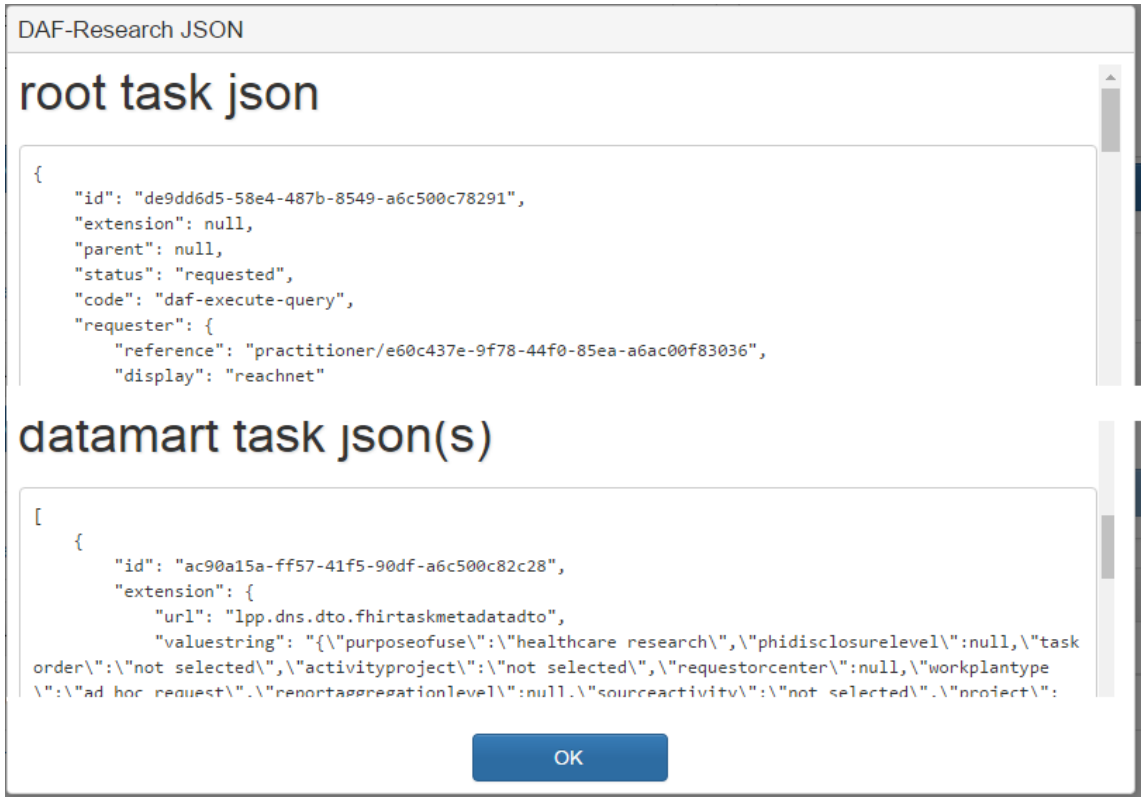
C3 Capability – Awaiting Response

Step 3 – PMN has now published this query as a daf-Task resource and is awaiting responses



C3 Capability – View DAF JSON for Query

Step 4 – The published DAF resources can be viewed using the View DAF-Research JSON button which will show both the Root Task and the DataMart Task(s)



Note: A complete Task example JSON is provided in a separate ZIP package.

C4 Capabilities

C4-1	Query Composer SHALL be capable of displaying aggregate data returned back from Query Responder.
C4-2	Query Composer SHALL expose the Query Results via RESTful APIs to facilitate third party apps to provide value added functionality.
C4-3	How long should the data remain?
C4-4	Query Responder SHALL define the structure and semantics for returning Aggregate Data for research queries.
C4-5	Query Responder SHALL populate the Aggregate Data for research queries based on Query Metadata.
C4-6	Query Responder SHALL NOT include any PII or PHI information as part the Aggregate Data being returned.
C4-7	Query Responder SHALL ensure individual patients cannot be identified based on the Aggregate Data.
C4-8	Query Responder SHALL include Query Metadata as part of the query results.

C4 Implementation Overview

PMN Query Composer

Query composer will function as it currently does waiting for responses from DataMarts.

Update execution Task

PMN Datamart Client

Execute the query and format results into FHIR Task, post to PMN

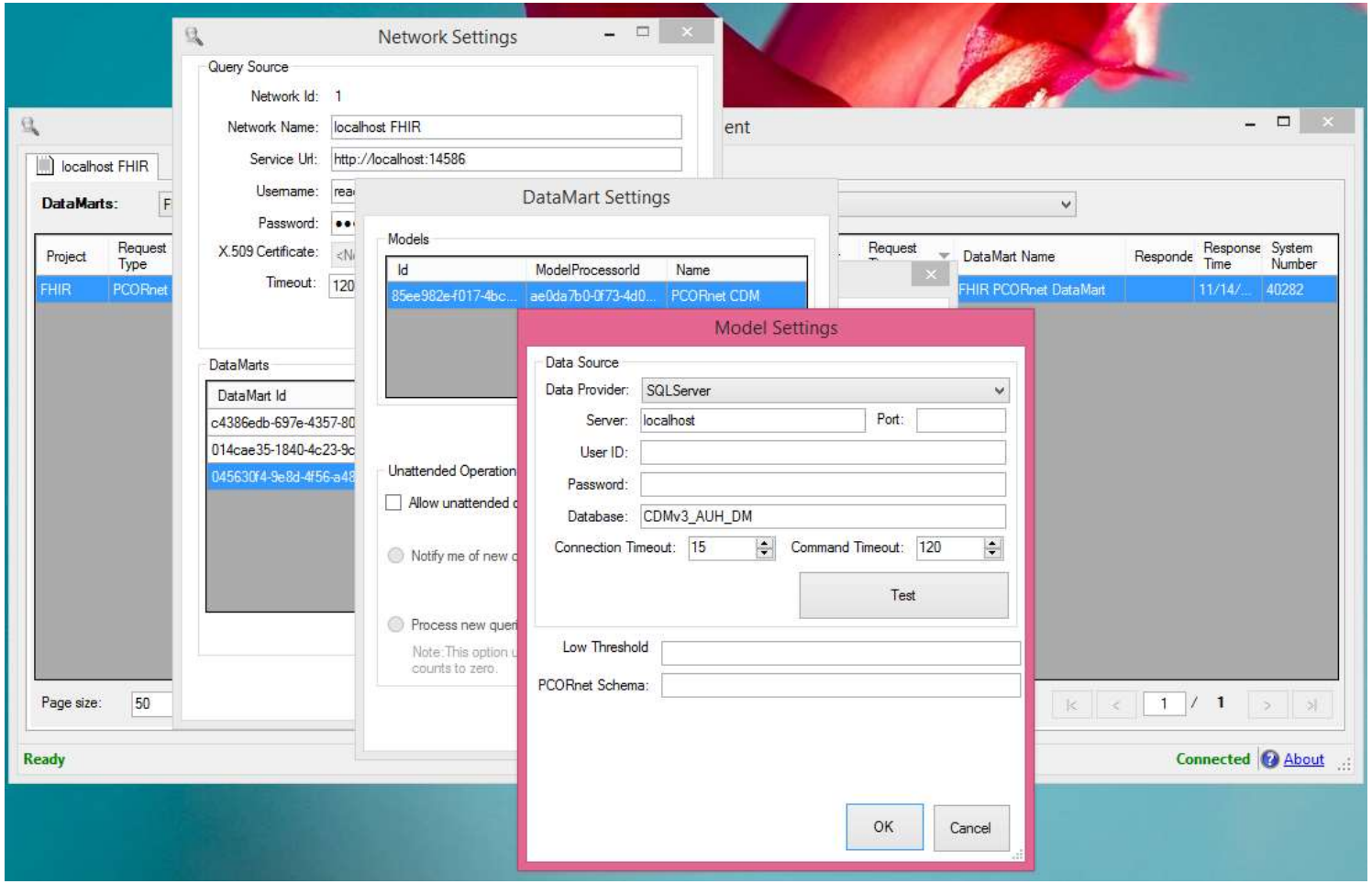
FHIR endpoint:
http://pmn.com/fhir/task

1. DMC executes PMN JSON query using existing mechanism
2. DMC gets results and format them into FHIR DAF-queryresults on Task resource
3. DMC will PUT a the updated instance of Task using PMN FHIR end-point: **http://pmn.com/fhir/task**
4. PMN Query Composer will detect DataMart responses and present results to researcher.

Note: PMN will parse and store the FHIR requests, but will translate these requests into standard PMN structures.

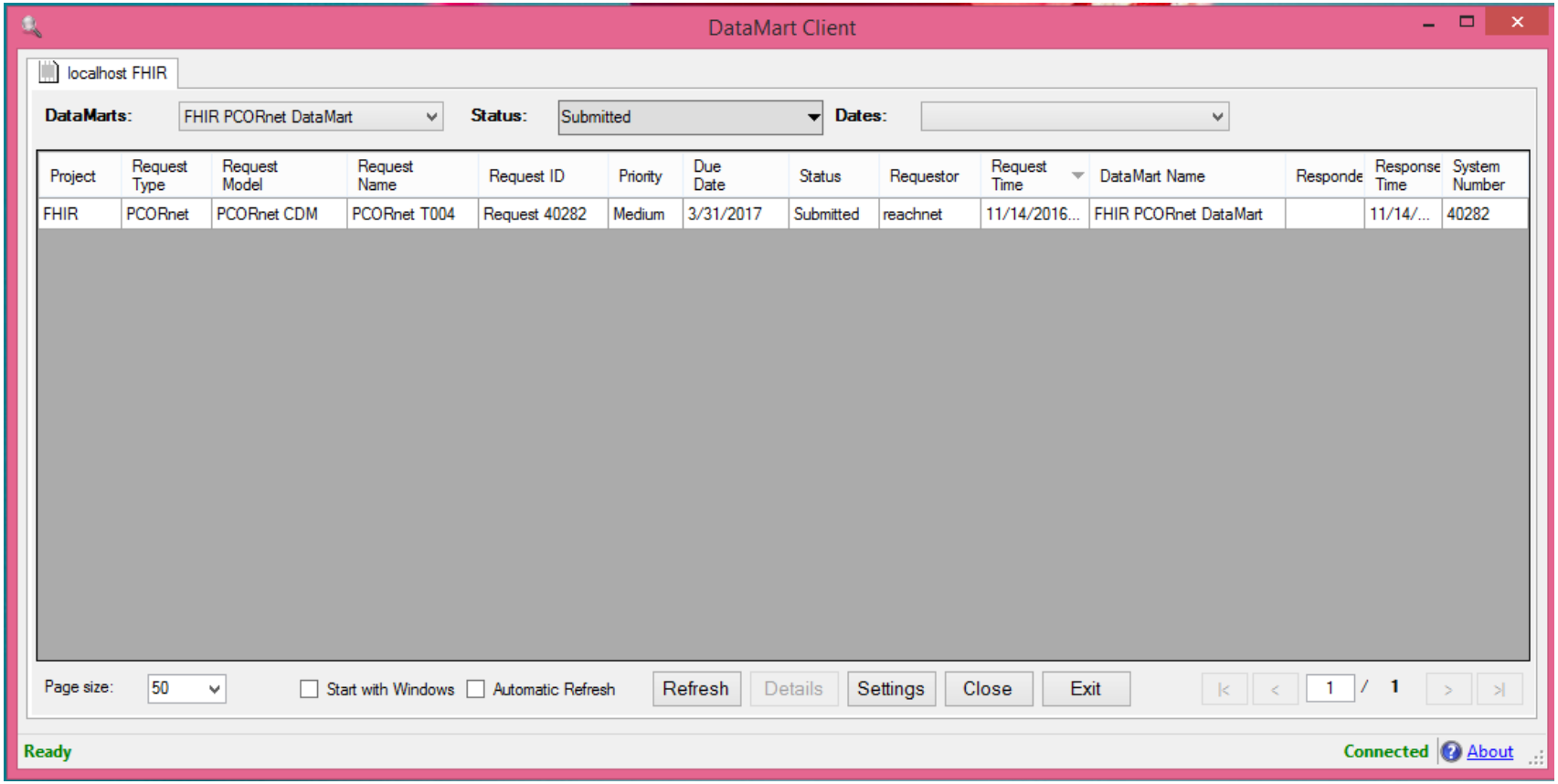
C4 Capability – Configure DataMart in DataMartClient (DMC)

Step 1 – DataMart administrator configures the DMC to connect to the PCORnet Data Source



C4 Capability – View Query List in DMC

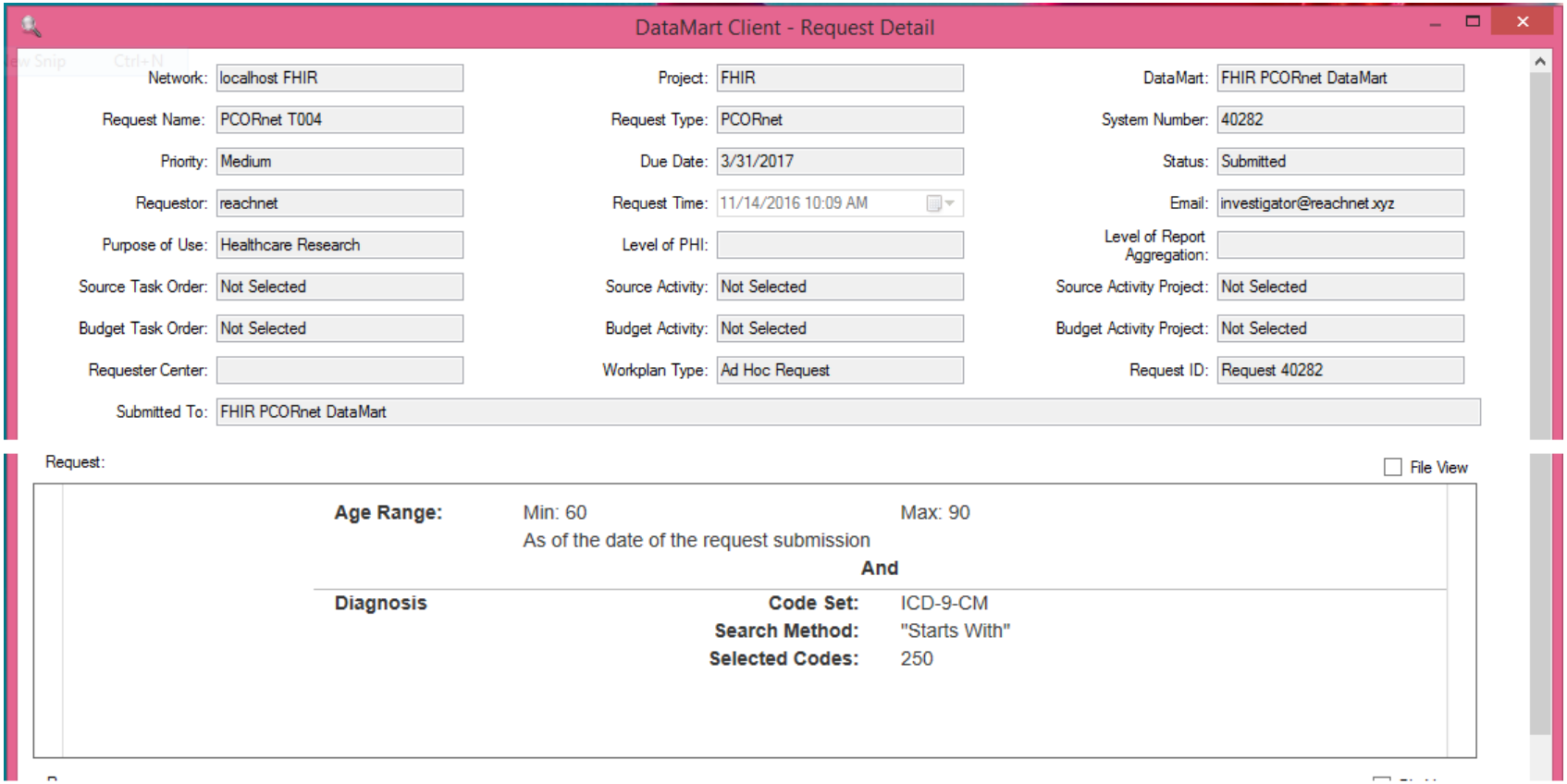
Step 2 – DMC retrieves the list of research requests using the Task resource



Note – The implementation uses the _filter mechanism on the Task resource to allow for more complex filtering so that all DMC functionality can be maintained.

C4 Capability – View Query Details in DMC

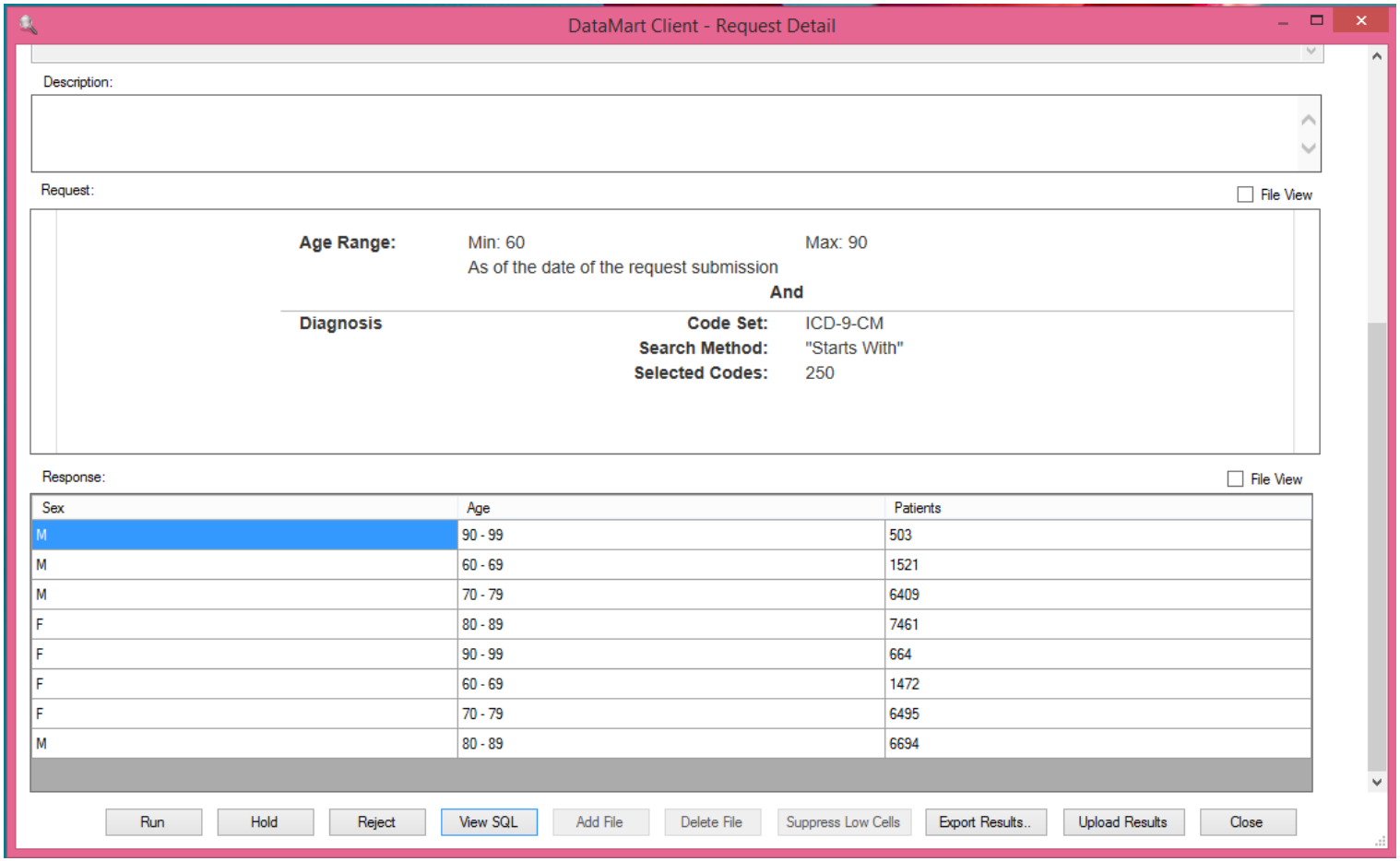
Step 3 – DataMart user can review the request before executing the research query



Note – In order to provide the same level of DMC functionality, the additional PMN project information was placed in an Extension node within the standard Task resource.

C4 Capability – View Details & Execute Query in DMC

Step 4 – DataMart User can execute the query, review the result and upload to researcher



C4 Capability – DataMartClient Log file

Log File Snippet – In order to provide a view into the exchanges between the DMC and the PMN Query Composer. The DMC log file now contains all calls and JSON resource exchanged with the PMN DAF API implementation.

The following is a condensed log file showing the exchanges via FHIR DAF resources.

```
INFO  2016-11-14 11:58:45,136   - FHIR TASK (GET) Request to get list of requests. URL: {/fhir/task?_filter=(sta
INFO  2016-11-14 11:58:45,137   - JSON Content: [{"id":"6769f785-f66b-4b6b-b911-a6b700de00b5","extension":{"url"

INFO  2016-11-14 12:00:19,486   - FHIR TASK (GET) Request to get specific request details. URL: {/fhir/task/6697
INFO  2016-11-14 12:00:19,490   - JSON Content: [{"id":"35634143-0a03-41ea-af90-a6be00c18eee","extension":{"url"

INFO  2016-11-14 12:01:44,509   - FHIR TASK (POST) Request to create documents in PMN. URL: {/fhir/task}.
INFO  2016-11-14 12:01:44,582   - JSON Content: [{"id":"00000000-0000-0000-0000-000000000000","extension":null,"

INFO  2016-11-14 12:01:45,870   - FHIR TASK (PUT) Request to Upload Output of Request. URL: {/fhir/task/f36fbd84
INFO  2016-11-14 12:01:45,873   - JSON Content: {"id":"f36fbd84-fbf4-4b9b-9f64-a6be00c18eee","extension":{"url":

INFO  2016-11-14 12:01:47,316   - FHIR TASK (GET) Request to get specific request details. URL: {/fhir/task/6697
INFO  2016-11-14 12:01:47,317   - JSON Content: [{"id":"35634143-0a03-41ea-af90-a6be00c18eee","extension":{"url"

INFO  2016-11-14 12:01:47,322   - FHIR TASK (PUT) Request to Update Request Status. URL: {/fhir/task/35634143-0a
INFO  2016-11-14 12:01:47,323   - JSON Content: {"id":"35634143-0a03-41ea-af90-a6be00c18eee","extension":{"url":

INFO  2016-11-14 12:01:51,151   - FHIR TASK (GET) Request to get list of requests. URL: {/fhir/task?_filter=(sta
INFO  2016-11-14 12:01:51,152   - JSON Content: [{"id":"35634143-0a03-41ea-af90-a6be00c18eee","extension":{"url"
```

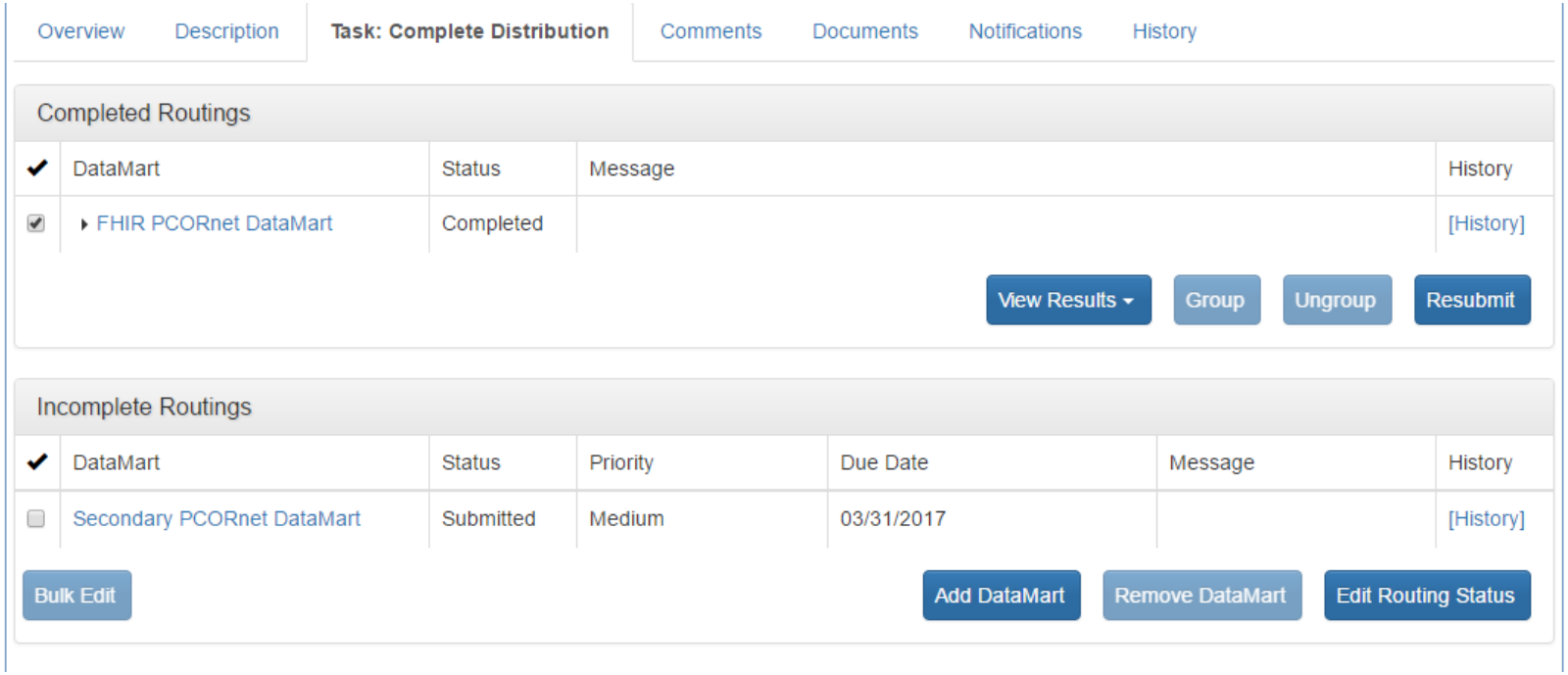
C4 Capability – DAF Task – Response JSON

Result Data – The response data is formatted into a Task and DAF-Queryresults JSON to upload the response back to the researcher via PMN. The following is a snippet of that JSON.


```
"output": [
  {
   "type": "DAF-queryresults",
   "valueDAF-queryresults": [
    {
     "category": "Patient",
     "code": "Patient",
     "component": [
      {
       "code": "Sex",
       "valueString": "M",
       "interpretation": "None"
      },
      {
       "code": "Age",
       "valueString": "90-99",
       "interpretation": "None"
      }
     ],
     "count": {
      "code": "Patients",
      "valueInteger": 503,
      "interpretation": "Count"
     }
    },
    {
     "category": "Patient",
     "code": "Patient",
     "component": [
      {
       "code": "Sex",
       "valueString": "M",
       "interpretation": "None"
      },
      {
       "code": "Age",
       "valueString": "60-69",
       "interpretation": "None"
      }
     ],
     "count": {
      "code": "Patients",
      "valueInteger": 1521,
      "interpretation": "Count"
     }
    },
```

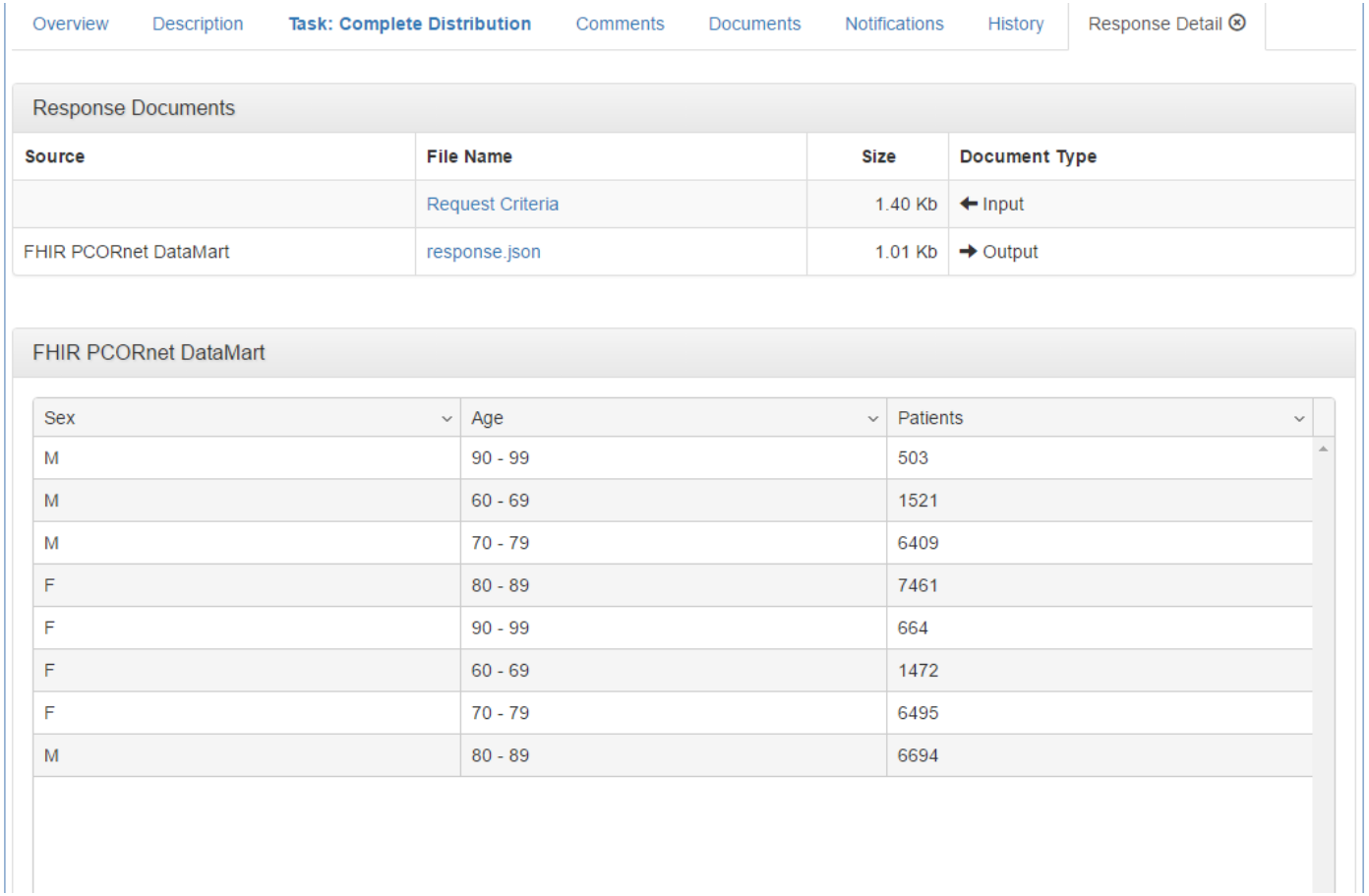
C4 Capability – Response Received in Query Composer

Step 6 – Research gets the response(s) from the DataMart(s) and can now view the results



C4 Capability – View Response Results in Query Composer

Step 7 – Research can now view the results returned from the DMC using DAF-Task



Overview | Description | **Task: Complete Distribution** | Comments | Documents | Notifications | History | Response Detail

Response Documents

Source	File Name	Size	Document Type
	Request Criteria	1.40 Kb	← Input
FHIR PCORnet DataMart	response.json	1.01 Kb	→ Output

FHIR PCORnet DataMart

Sex	Age	Patients
M	90 - 99	503
M	60 - 69	1521
M	70 - 79	6409
F	80 - 89	7461
F	90 - 99	664
F	60 - 69	1472
F	70 - 79	6495
M	80 - 89	6694

Pilot Testing

- Developer unit testing of RESTful API
  - » CURL utility was used to manually validate the function of the RESTful resources required for C2 – C4
- Developer integration testing of RESTful API
  - » Visual validation of PMN functionality
  - » Visual validation of DAF JSON (Query Composer)
  - » Visual validation of DAF JSON (DataMart Client logs)
  - » Confirmation of results using unmodified PMN against same data source.
- Final Integration testing to be done in conjunction with REACHNet to confirm C1 – C4 end-to-end functionality(in progress)

Final Result

The Lincoln Peak Pilot completed an implementation of DAF-Research Capabilities 2, 3 and 4 using the PopMedNet™ platform as the basis for the implementation.

C2: Standardize metadata about data marts, CDRN's, PPRN's and data sources.

C3: Standardize Query Distribution mechanism metadata

C4: Standardize Query Results for returning aggregate data

Note: This implementation only supports the JSON resource format.

Lessons Learned

Lessons Learned

- More work needs to be done on the DataMart Metadata. Currently the most useful information is the Provenance data, but early design discussions indicated that much more information can be provided here.
- The proposed DAF-Research IG accomplishes it's main objective of distributing research queries and responding to research queries using the RESTful resources.

DataMart Task JSON Extension

In order to maintain the level of functionality provided by PMN, additional information was placed in extension nodes in the DAF JSON. Most of this information is related to PMN Projects. See the following sample:


```
{
  "purposeOfUse": "Healthcare Research",
  "phiDisclosureLevel": null,
  "taskOrder": "Not Selected",
  "activityProject": "Not Selected",
  "requestorCenter": null,
  "workplanType": "Ad Hoc Request",
  "reportAggregationLevel": null,
  "sourceActivity": "Not Selected",
  "Project": {
    "Name": "FHIR",
    "Description": null,
    "StartDate": "2016-10-01T04:00:00",
    "EndDate": null
  },
  "sourceActivityProject": "Not Selected",
  "sourceTaskOrder": "Not Selected"
}
```

Execution Task JSON Extension

Some additional information was placed in the Response task in order to maintain PMNs ability to aggregate the results from multiple DataMarts when displaying the results in the PMN Query Composer. See the following sample:


```
{
 "LowCellThrehold": null,
 "Properties": [
  {
   "Name": "Sex",
   "Type": "System.String",
   "As": "Sex",
   "Aggregate": null
  },
  {
   "Name": "Age",
   "Type": "System.String",
   "As": "Age",
   "Aggregate": null
  },
  {
   "Name": "PatientID",
   "Type": "System.Int32",
   "As": "Patients",
   "Aggregate": "Sum"
  }
 ],
"Aggregation": {
 "GroupBy": [
  "Sex",
  "Age"
 ],
 "Select": [
  {
   "Name": "Sex",
   "Type": "System.String",
   "As": "Sex",
   "Aggregate": null
  },
  {
   "Name": "Age",
   "Type": "System.String",
   "As": "Age",
   "Aggregate": null
  },
  {
   "Name": "Age",
   "Type": "System.String",
   "As": "Age",
   "Aggregate": null
  },
  {
   "Name": "PatientID",
   "Type": "System.Int32",
   "As": "Patients",
   "Aggregate": "Sum"
  }
 ],
 "Name": null
 }
}
```

Security, Privacy, and Provenance

The DAF-Research RESTful resources were all implemented within the PMN security framework. This provides the DAF-Research RESTful resources with the same level of security and permissions management as the PMN product itself.

Path Forward

Next Steps

- Defining a standard for authentication and authorization in the DAF-Research IG will be required for this to provide system interoperability.
- Expanding the DataMart Metadata to include additional information discussed in early design meeting such as Data Dictionary, DataMart Environment, Data Governance, etc . Some of these elements could be key to a truly interoperable research network.
- Continue the design and development of Capability 5 to standardize Query Results for returning de-identified or identified patient data
- Continue the design and development of Capability 6 to standardize Query Structure and Queries for identifying cohorts/populations
- Further discussions are required to socialize the benefits of the FHIR DAF-Research IG and to determine how best to integrate it into future product roadmaps.

Useful Links and Completed Artifacts

- The following resources (listed below) can be accessed here: https://drive.google.com/drive/folders/0B_FN6rOUiCz6c2dwS0xmS0J5Rk0
  - » C3 & C4 PopMedNet(tm) Query Process Example.docx
  - » C2 Sample JSONs.zip
  - » C3 & C4 Sample JSONs.zip

LPP Contacts

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Questions

Next Steps

- Upcoming Meetings
  - **Combined Pilot Technical Workgroup (TWG):** Wednesday, December 7, 2016 at 10:00 AM (ET)
  - **All Hands Community Call:** Wednesday, December 14, 2016 at 12:00 PM (ET)
  - **InM WG Call:** Monday, December 12, 2016 at 1:00 PM (ET)

- HL7 Timeline
  - **HL7 Ballot Pool Sign-Up:** November 7-December 8, 2016
  - **HL7 Ballot Opens:** December 9-January 9, 2017
  - **HL7 FHIR Connectathon 14:** January 14-January 15, 2017
  - **January HL7 WGM (San Antonio, TX):** January 15-January 20, 2017

DAF Support Team

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DAF Publications

- DAF FHIR IG DSTU (HL7)
  - On September 23, 2015, Health Level Seven® International (HL7®) published Release 2 of the HL7 Fast Healthcare Interoperability Resources (FHIR®) Draft Standard for Trial Use (DSTU). Additionally, we are pleased to announce that the DAF FHIR Implementation Guide, a US-realm specific implementation guide, has also been published! The DAF FHIR IG identifies and recommends standards for the interoperable representation and transmission of data using the notion of a Query Stack which modularizes the various layers of the Data Access Framework.

- DAF Document Metadata Based Access IG (IHE)
  - On September 24, 2015, the Integrating the Healthcare Enterprise (IHE) Patient Care Coordination (PCC) Technical Committee published The Data Access Framework (DAF) Document Metadata Based Access Implementation Guide. This US National Extension provides requirements and guidance on accessing clinical documents created during clinical workflows. The guide accomplishes this using RESTful resources based on HL7 FHIR® and the more traditional SOAP based IHE Profiles.

  - On October 24, 2014, the IHE Patient Care Coordination (PCC) domain published the DAF White Paper, A Data Access Framework Using IHE Profiles as a resource artifact under the IHE technical framework resources.

The Office of the National Coordinator for Health Information Technology

Useful Links

DAF Wiki Homepage:
https://oncprojectracking.healthit.gov/wiki/display/TechLabSC/DAF+Home

DAF Initiative Signup:
https://oncprojectracking.healthit.gov/wiki/display/TechLabSC/Join+the+DAF+Initiative

DAF Past Meetings:
https://oncprojectracking.healthit.gov/wiki/display/TechLabSC/DAF+Past+Meetings