The "X" folder is src/main/java/snomedct.  🙂

You can change the package to "package snomedct", which is what is in the other

java files I believe.

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**From:** Pedersen, Jay G <[jay.pedersen@unmc.edu](mailto:jay.pedersen@unmc.edu)>  
**Sent:** Friday, April 3, 2020 11:56 AM  
**To:** Tom Balmat <[thomas.balmat@duke.edu](mailto:thomas.balmat@duke.edu)>  
**Subject:** Re: IMPORTANT -- Jay at UNMC -- NEO4J 3.5.x -- a Java plugin example -- finds all subsumed codes of a NEO4J code

Hi Tom,

Here is an additional Java file ... which defines the map\_create() and map\_set() methods

that I was using in the last example I set.

If you add this as MapRoutines.java in the X folder and then build the jar file,

then you will have those routines.

package edu.unmc.necares;

import org.neo4j.graphdb.GraphDatabaseService;

import org.neo4j.logging.Log;

import org.neo4j.procedure.UserFunction;

import org.neo4j.procedure.Name;

import org.neo4j.procedure.Context;

import java.util.List;

import java.util.Map;

import java.util.HashMap;

public class MapRoutines {

    @Context

    public GraphDatabaseService db;  // GraphDB reference

    @Context

    public Log log; // log file reference

    @UserFunction(name = "snomedct.map\_create")

    public Map<String,List<String>> collection\_map\_create() {

        return new HashMap<>();

    }

    @UserFunction(name = "snomedct.map\_set")

    public Map<String,List<String>> collection\_map\_set(

            @Name("map") Map<String,List<String>> map,

            @Name("key") String key,

            @Name("collection") List<String> collection) {

        map.put(key, collection);

        return map;

    }

}

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**From:** Pedersen, Jay G <[jay.pedersen@unmc.edu](mailto:jay.pedersen@unmc.edu)>  
**Sent:** Friday, April 3, 2020 11:48 AM  
**To:** Tom Balmat <[thomas.balmat@duke.edu](mailto:thomas.balmat@duke.edu)>; Rachel Richesson, Ph.D. <[rachel.richesson@duke.edu](mailto:rachel.richesson@duke.edu)>  
**Subject:** Re: IMPORTANT -- Jay at UNMC -- NEO4J 3.5.x -- a Java plugin example -- finds all subsumed codes of a NEO4J code

Here is an example that shows the difference of "distinct patients" versus the raw count of patients

who have one or more of the sub-conditions of mental disorder.

with snomedct.map\_create() as sctids, snomedct.map\_create() as patids

with patids, snomedct.map\_set(sctids, "mental\_disorders", snomedct.code\_subsumes\_codes('74732009')) as sctids

with patids, snomedct.map\_set(sctids, 'nervous\_system\_disorders', snomedct.code\_subsumes\_codes('118940003')) as sctids

MATCH (p1:Participant)-[:P\_SCT]->(o1:ObjectConcept) where o1.sctid in sctids["mental\_disorders"]

return count(p1), count(distinct p1)

In my db, I get 569 as count(p1), but 314 as count(distinct p1)

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**From:** Tom Balmat <[thomas.balmat@duke.edu](mailto:thomas.balmat@duke.edu)>  
**Sent:** Friday, April 3, 2020 10:08 AM  
**To:** Pedersen, Jay G <[jay.pedersen@unmc.edu](mailto:jay.pedersen@unmc.edu)>; Rachel Richesson, Ph.D. <[rachel.richesson@duke.edu](mailto:rachel.richesson@duke.edu)>  
**Subject:** RE: IMPORTANT -- Jay at UNMC -- NEO4J 3.5.x -- a Java plugin example -- finds all subsumed codes of a NEO4J code

Non-UNMC email

Thanks.  I’ll use this for testing.  Tom

**From:** Pedersen, Jay G <[jay.pedersen@unmc.edu](mailto:jay.pedersen@unmc.edu)>   
**Sent:** Friday, April 3, 2020 11:00 AM  
**To:** Tom Balmat <[thomas.balmat@duke.edu](mailto:thomas.balmat@duke.edu)>; Rachel Richesson, Ph.D. <[rachel.richesson@duke.edu](mailto:rachel.richesson@duke.edu)>  
**Subject:** Re: IMPORTANT -- Jay at UNMC -- NEO4J 3.5.x -- a Java plugin example -- finds all subsumed codes of a NEO4J code

A little better example -- show count of distinct patients with

any form of Mental Disorder (according to subsumed codes in SNOMED

by ISA relationships).

with snomedct.code\_subsumes\_codes('74732009') as codes

match (p:Participant)-[:P\_SCT]->(pn:ObjectConcept) where pn.sctid in codes

with distinct(p) as affected\_pats

return count(affected\_pats)

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**From:** Pedersen, Jay G <[jay.pedersen@unmc.edu](mailto:jay.pedersen@unmc.edu)>  
**Sent:** Friday, April 3, 2020 9:18 AM  
**To:** Tom Balmat <[thomas.balmat@duke.edu](mailto:thomas.balmat@duke.edu)>; Rachel Richesson, Ph.D. <[rachel.richesson@duke.edu](mailto:rachel.richesson@duke.edu)>  
**Subject:** Re: IMPORTANT -- Jay at UNMC -- NEO4J 3.5.x -- a Java plugin example -- finds all subsumed codes of a NEO4J code

I think my CYPHER code wasn't clear on using the Plugin.

Here is an example that finds more than 1900 codes

that are subtypes of Mental Disorders (all descendants,

regardless of how far away).

with snomedct.code\_subsumes\_codes('74732009') as a

return a

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**From:** Tom Balmat <[thomas.balmat@duke.edu](mailto:thomas.balmat@duke.edu)>  
**Sent:** Friday, April 3, 2020 9:13 AM  
**To:** Pedersen, Jay G <[jay.pedersen@unmc.edu](mailto:jay.pedersen@unmc.edu)>; Rachel Richesson, Ph.D. <[rachel.richesson@duke.edu](mailto:rachel.richesson@duke.edu)>  
**Subject:** RE: IMPORTANT -- Jay at UNMC -- NEO4J 3.5.x -- a Java plugin example -- finds all subsumed codes of a NEO4J code

Non-UNMC email

Got it.

**From:** Pedersen, Jay G <[jay.pedersen@unmc.edu](mailto:jay.pedersen@unmc.edu)>   
**Sent:** Friday, April 3, 2020 7:25 AM  
**To:** Tom Balmat <[thomas.balmat@duke.edu](mailto:thomas.balmat@duke.edu)>; Rachel Richesson, Ph.D. <[rachel.richesson@duke.edu](mailto:rachel.richesson@duke.edu)>  
**Subject:** Re: IMPORTANT -- Jay at UNMC -- NEO4J 3.5.x -- a Java plugin example -- finds all subsumed codes of a NEO4J code

The title should have been "subsumed codes of a SNOMEDCT code", not a NEO4J code.

I am going to try to send you an update today, and a more extensive example

where the transitive closures of multiple codes are involved.

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**From:** Pedersen, Jay G  
**Sent:** Thursday, April 2, 2020 9:26 PM  
**To:** Tom Balmat <[thomas.balmat@duke.edu](mailto:thomas.balmat@duke.edu)>; Rachel Richesson, Ph.D. <[rachel.richesson@duke.edu](mailto:rachel.richesson@duke.edu)>  
**Subject:** IMPORTANT -- Jay at UNMC -- NEO4J 3.5.x -- a Java plugin example -- finds all subsumed codes of a NEO4J code

Hi Tom,

SUMMARY

Let me know if you are in receipt of this, and if you are able to build and

install this (presuming that you would still like to try out the plugin functionality).

This is a zip file with the Java code and pom.xml file needed to build it and

instructions on building and installing it from a command line where java and

maven tools exist.  I was using java 8 and maven 3.05, which are available with

CENTOS 7.  I think java 8 needs to be used for NEO4J 3.5.x.

We can chat and I can try to walk you through it as needed.

DETAILS part 1

Attached is a zip file containing a Java plugin for NEO4J, and the "pom.xml" file

needed for maven to build it.  It is set up to work with NEO4J 3.5.x releases,

and I believe that works for Duke.  It's changes to pom.xml that are needed

to create a version for a newer NEO4J.  If there were no breaking changes

to the API then the Java code needs no changes.  I typically only make

changes to the Java code when I want new functionality.  I haven't run

into a lot of breaking changes from the NEO API.

I can come up with some better examples for you, but I provide

a relatively simple one at the end of this email in step #5.

I think I can also give you a little better version of the library later that

lets you manage collections of SNOMED or RxNORM codes in a

relatively straight-forward way.

DETAILS part 2

--- Step #1. Build the jar file ----

You build it via "mvn clean install" and it takes a while, but it builds a jar file

in the "target" subfolder.  The jar file is named  snomedct\_plugin-1.0.0.jar.

I used Java 8 (aka 1.8.0) which is what NEO4J 3.5.x is built with.

NOTE: NEO4J 4.0 uses Java 11, I believe.

-- Step #2. Install the jar file in the plugins folder, restart neo4j --

That jar file is then copied to the plugins subfolder of the neo4j installation.

In windows, I think each database has its own plugins folder.  Not the

case in Linux, at least the way I install it which I think is standard.

In linux, you have to set the file owner to be the user that runs the

neo4j server software.  In my case, that is user "neo4j".

NEO4J then needs to be restarted to make it load the plugin code.

-- Step #3. You should see the new functions in NEO4J"

Execute the following command in NEO4J:

call dbms.functions()

It should show the following somewhere in the list:

-- Step #4. Use the snomedct\_code\_subsumes\_codes function --

Example:

return size(a)

In this case, n my databases, I get a set of 1916 values.  I think this is because I don't

restrict the ISA path lengths to one hop.

At this point -- a -- is a variable which is a list of SNOMED codes.

-- Step #5. Look for patients with ANY of those codes

Something like this

with snomedct.code\_subsumes\_codes('74732009') as a

match (p:Participant)-[:P\_SCT]->(b:ObjectConcept) where b.sctid in a

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