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Cornell Institute for Social and Economic Research
A LEADER IN SOCIAL SCIENCE DATA AND COMPUTING

Improving User Access to Metadata for Public and Restricted Use US Federal Statistical Files

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Outline

- Overview of Cornell NSF-Census (NCRN) Node
- Comprehensive Extensive Data Documentation and Access Repository (CED^{2}AR)
  - Extract, Transform and Load (ETL)
  - Application Programming Interface (API)
  - User Interface (UI)
  - Coming Features of CED^{2}AR
- The Problem of Provenance
- Future NCRN Work

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Summary of NCRN Problem

- Inadequate curation of secure datasets
- Inconsistent or non-existent identification
- Need for selective hiding of data and metadata
- Scientific Method demands solution

“Those inside can’t see out, and those outside can’t see in!”

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NCRN DDI Solution at the Variable Level: <dataAccs>

```
<stdyDscr>
    <citation> [8 lines]
    <dataAccs ID="A1">
        <useStmt>
            <conditions>Public</conditions>
        </useStmt>
    </dataAccs>
    <dataAccs ID="A2">
        <useStmt>
            <confDec>To download this dataset, the user must obtain Special Sworn Status from the United States Census Bureau.</confDec>
            <conditions>Confidential</conditions>
        </useStmt>
    </dataAccs>
    <dataAccs ID="A3">
        <useStmt>
            <confDec>You're never gonna see this data.</confDec>
            <conditions>Need to know</conditions>
        </useStmt>
    </dataAccs>
</stdyDscr>
```

Variable Level Solution (continued)

```
<var ID="V1500" dcml="0" files="F3" intrvl="discrete" name="totfam_kids" access="A1">
    <location width="12"/>
    <labl>Total Number of Children in Family</labl>
    <valrng> [2 lines]
    <sumStat type="vald">1000</sumStat>
    <sumStat type="invd">0</sumStat>
    <catgry> [3 lines]
    <catgry> [3 lines]
    <catgry> [3 lines]
    <catgry> [3 lines]
    <catgry> [3 lines]
    <catgry> [3 lines]
    <catgry> [3 lines]
    <catgry> [3 lines]
    <varFormat schema="other" type="numeric"/>
</var>
<var ID="V1588" dcml="0" files="F3" intrvl="contin" name="totinc" access="A2">
    <location width="12"/>
    <labl>Total Personal Income</labl>
    <valrng> [2 lines]
    <sumStat type="vald">240</sumStat>
    <sumStat type="invd">760</sumStat>
    <sumStat type="min">-278.739</sumStat>
    <sumStat type="max">39515.631</sumStat>
    <sumStat type="mean">1861.779</sumStat>
    <sumStat type="stdev">4015.033</sumStat>
    <varFormat schema="other" type="numeric"/>
</var>
```

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No DDI Solution at the Level of a Value Label

```
<var ID="V1588" dcml="0" files="F3" intrvl="contin" name="totinc" access="A1">
    <location width="12"/>
    <labl>Total Personal Income</labl>
    <catgry>
        <catValu>0</catValu>
        <labl>5-25k</labl>
    </catgry>
    <catgry>
        <catValu>1</catValu>
        <labl>25-75k</labl>
    </catgry>
    <catgry>
        <catValu>2</catValu>
        <labl>75-125k</labl>
    </catgry>
    <catgry>
        <catValu>3</catValu>
        <labl>125-250k</labl>
    </catgry>
    <catgry access="A2">
        <catValu>4</catValu>
        <labl>250k+</labl>
    </catgry>
    <varFormat schema="other" type="numeric"/>
</var>
```

Small tweak to the DDI Codebook Schema would fix this.

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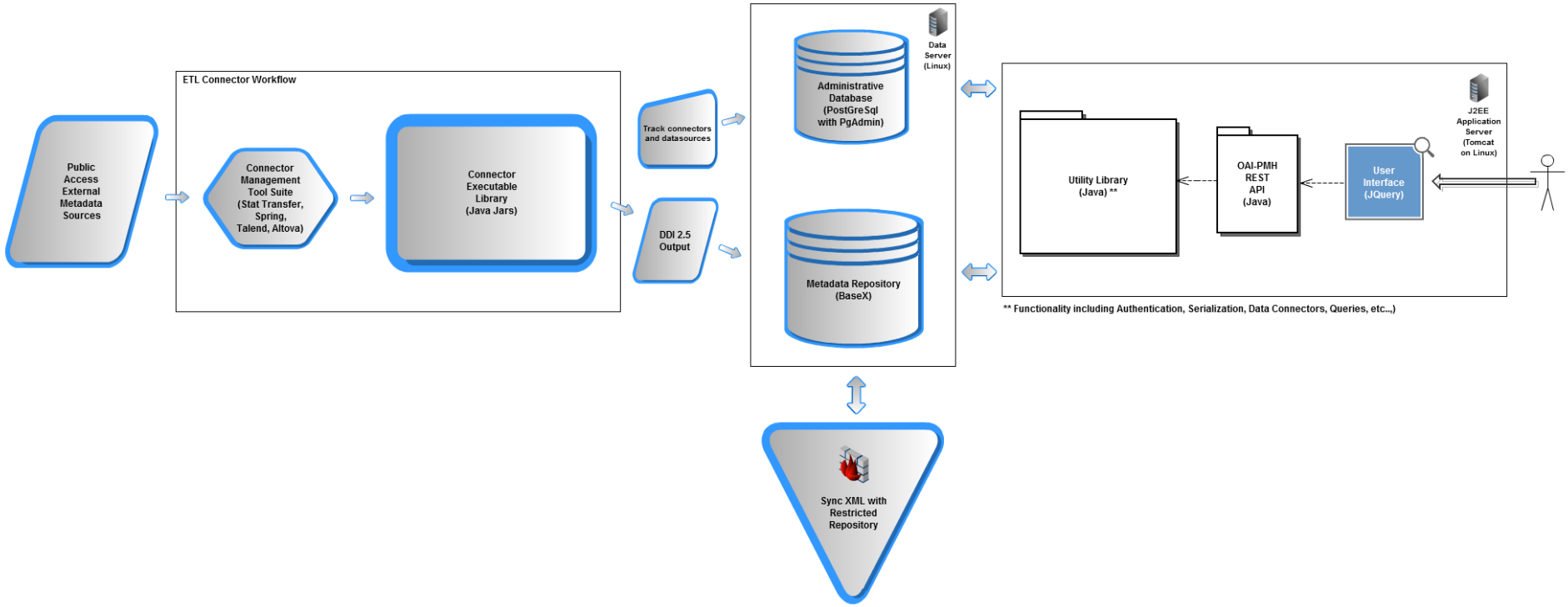
Schematic of NCRN System



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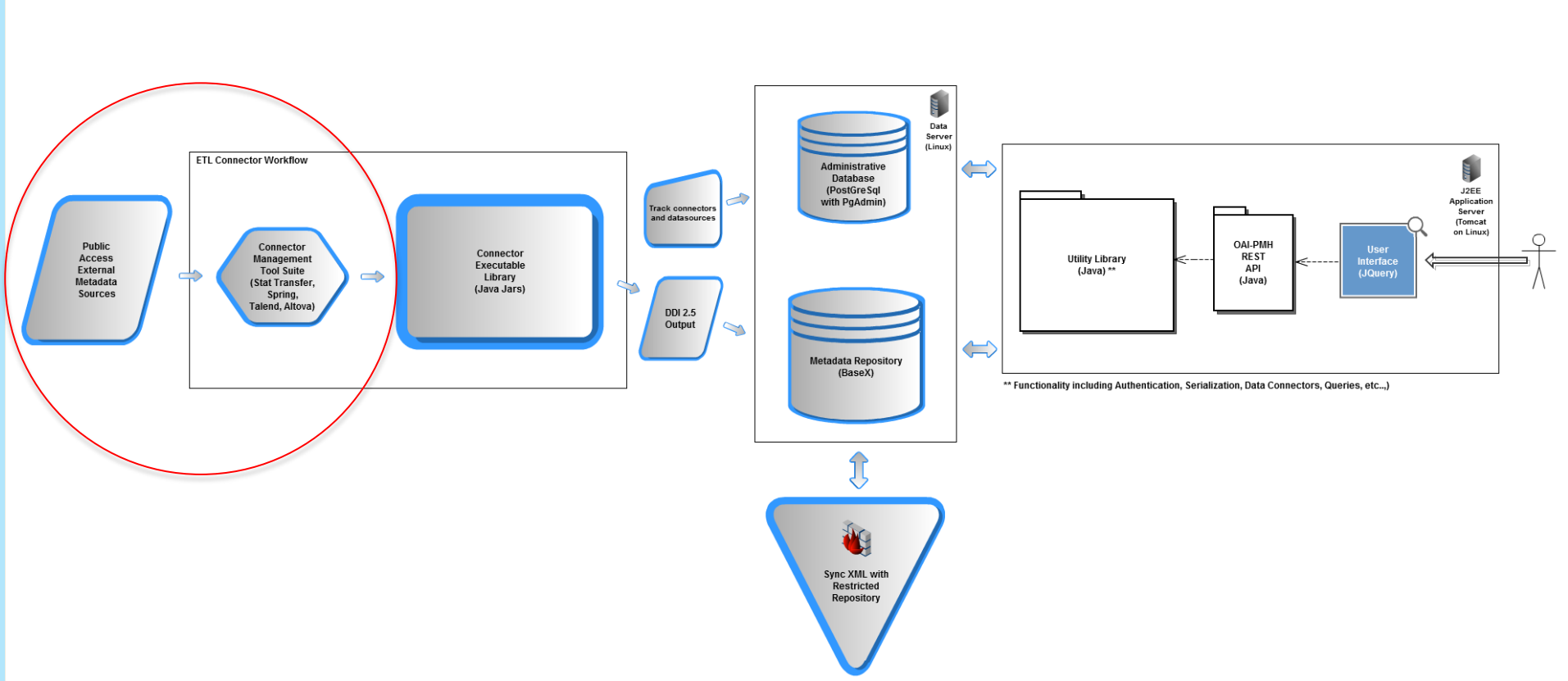
Schematic of NCRN System



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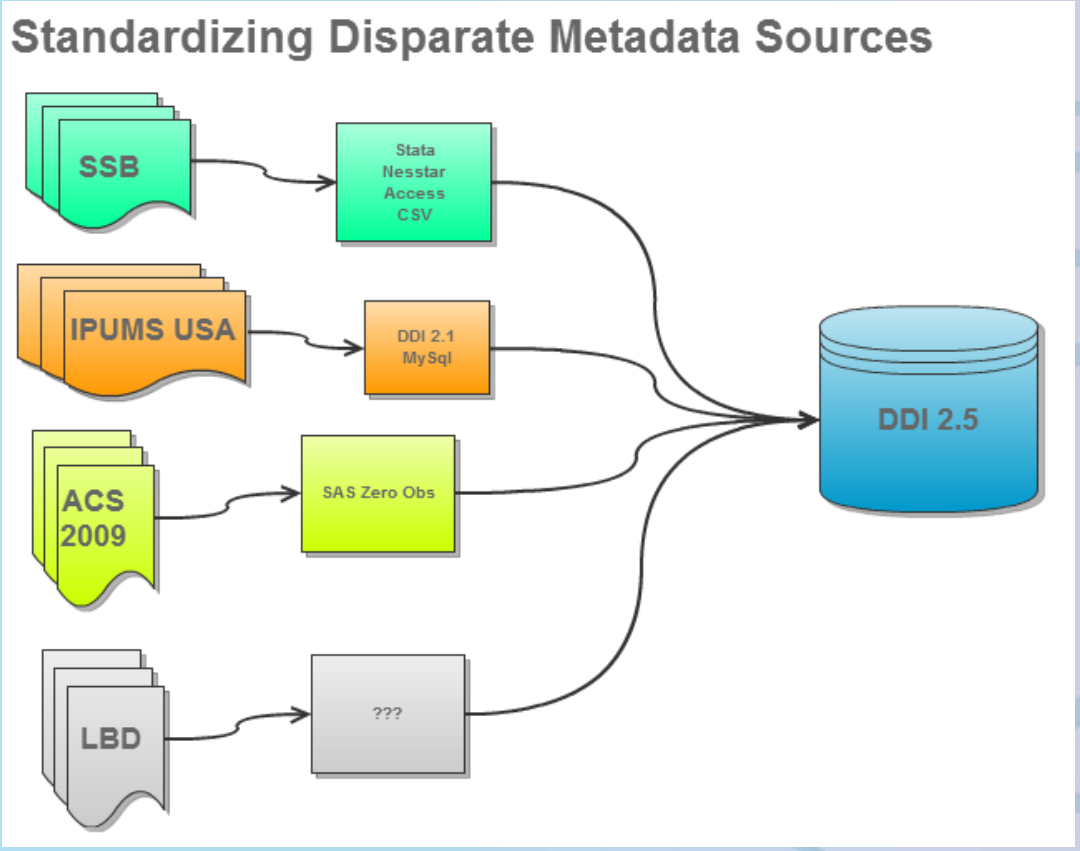
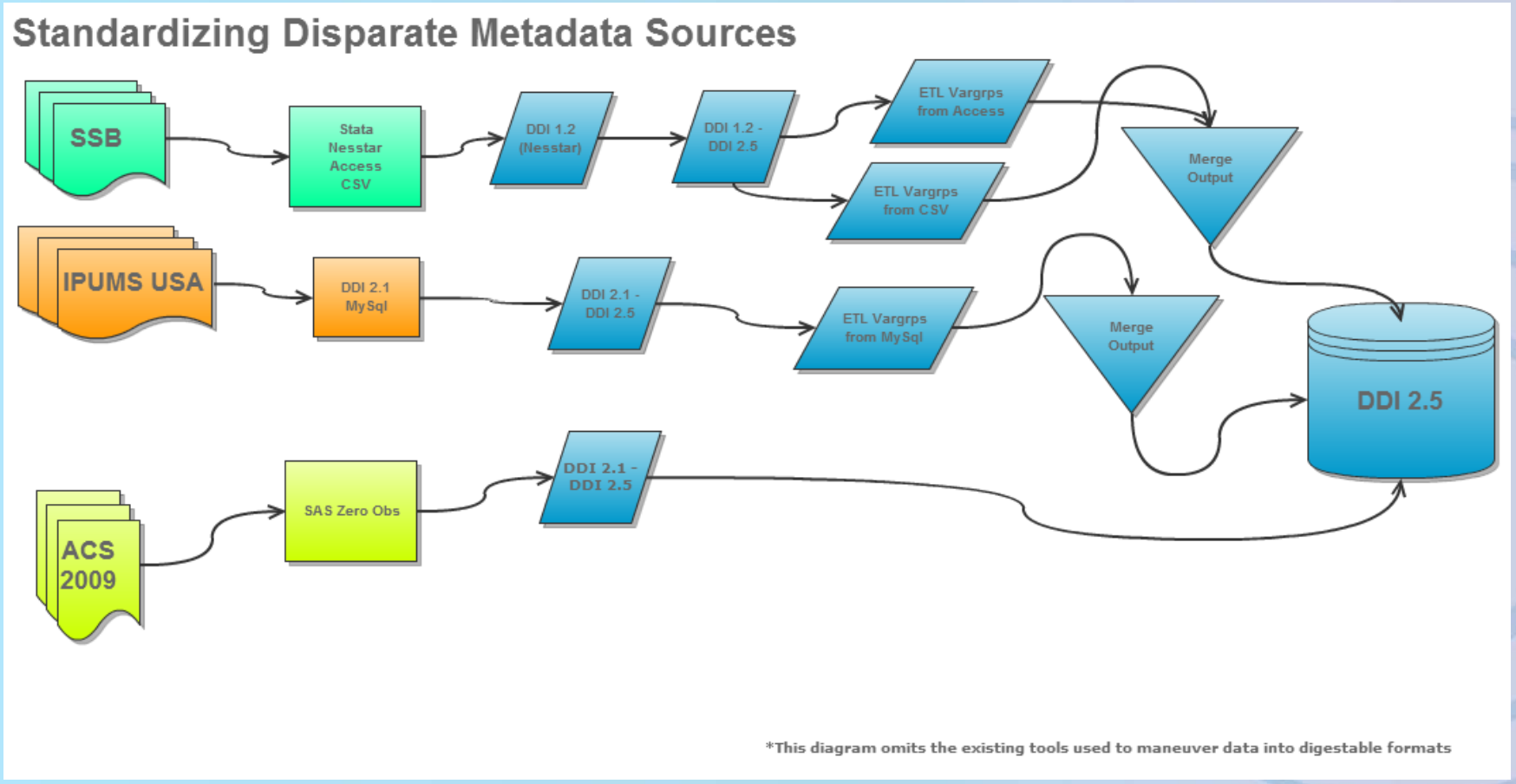
The challenge of ingesting disparate data

- Format disparity
- Schema disparity
- Sparceness of metadata



ETL Modular Approach – Building to Reuse



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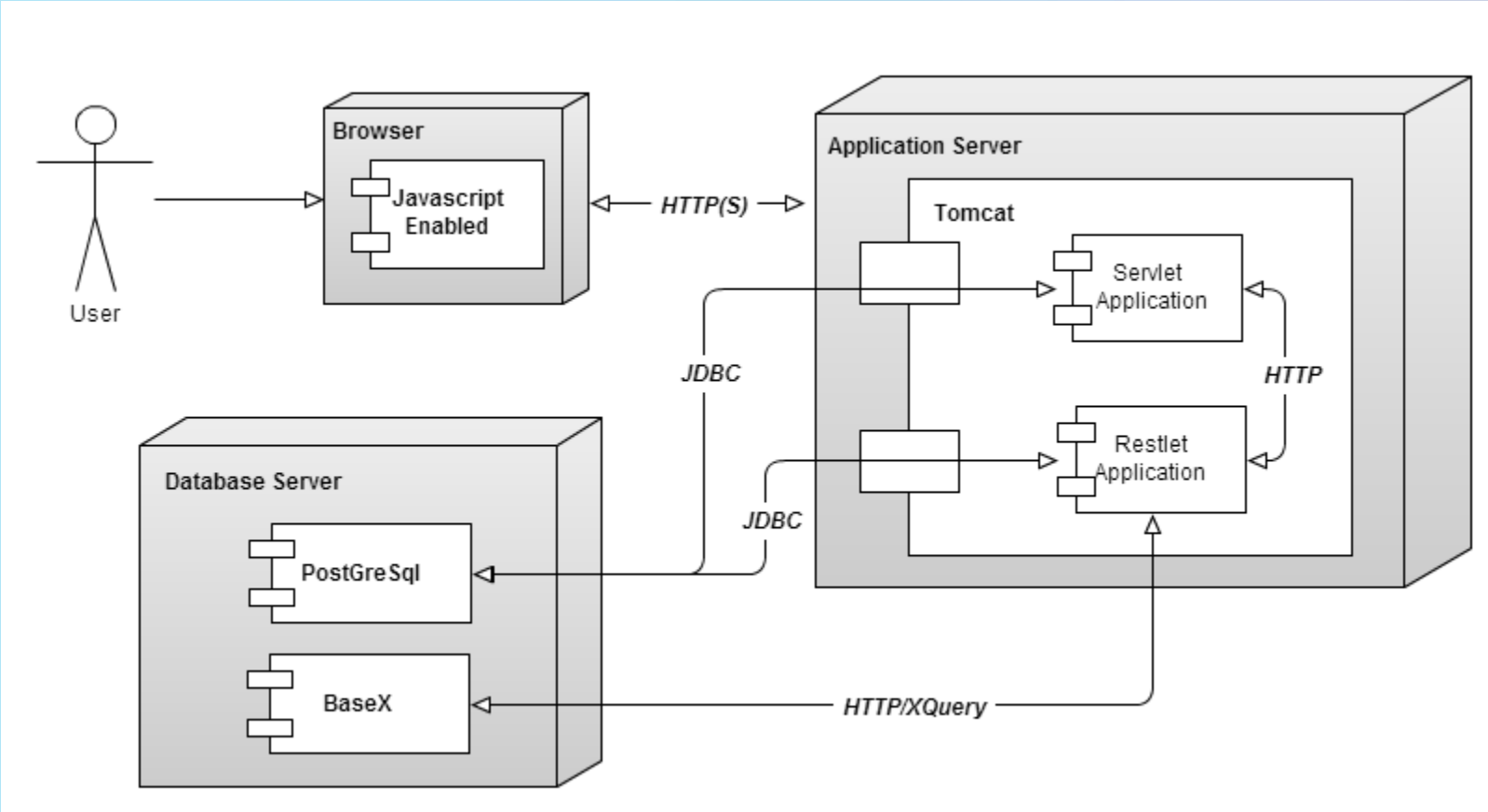
Component View of System



Application Programming Interface (API)

The benefits of REST

For our purposes, REST is a set of software architecture principles that leverage the intrinsic architecture of the Web.

Five Key Principles:

- Give everything (resource) an ID
- Link things together
- Uses standard methods
- Represent things (resources) in multiple ways
- Communicate so that the client and server are independent of one another

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Application Programming Interface (API)

Motivation – Simplicity for greater utility

From this:

{baseurl}/rest?query=let%20$ced2ar%20:=%20collection('CED2AR')%20for%20$var%20in%20$ced2ar/codeBook/dataDscr/var%20where%20%20starts-with(lower-case($var/@name),%20%22a%22)%20return%20$var

To this:

{baseurl}/search?return=variables&where=variablename=a*

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Application Programming Interface (API)

The API currently supports the following query parts:

- **Return**
  - A chosen set of fields within the DDI schema
- **Where**
  - A chosen set of supported DDI fields to filter your query by
  - And, or, 'and not'
  - Contains, starts-with, ends-with
- **Sort**
  - Descending, ascending
- **Limit**
  - (i.e.: give me results 10-50 from each codebook)

The API makes interacting with the repository easier because it abstracts away the underlying Xquery necessary to perform the query.

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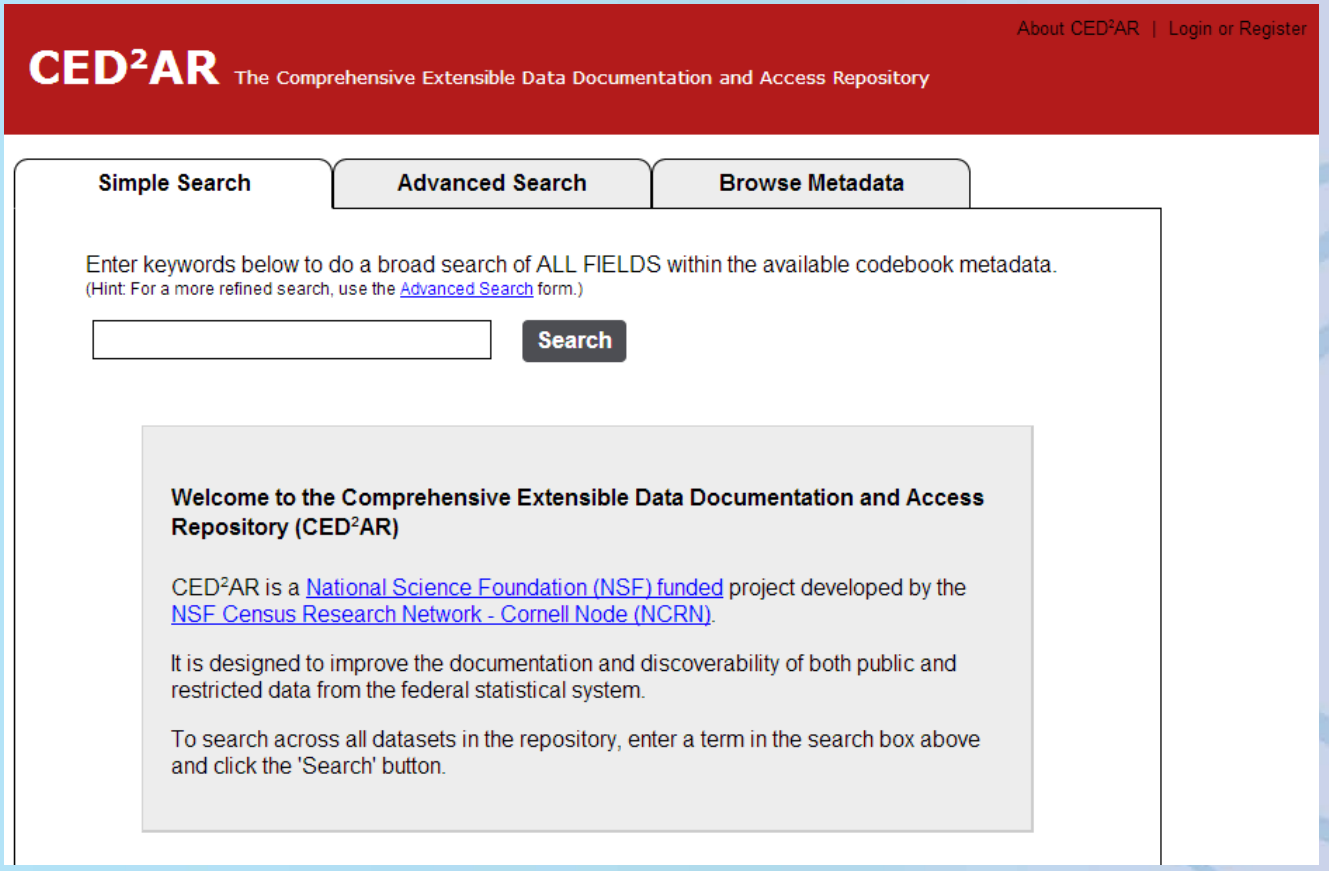
User Interface – Simple search



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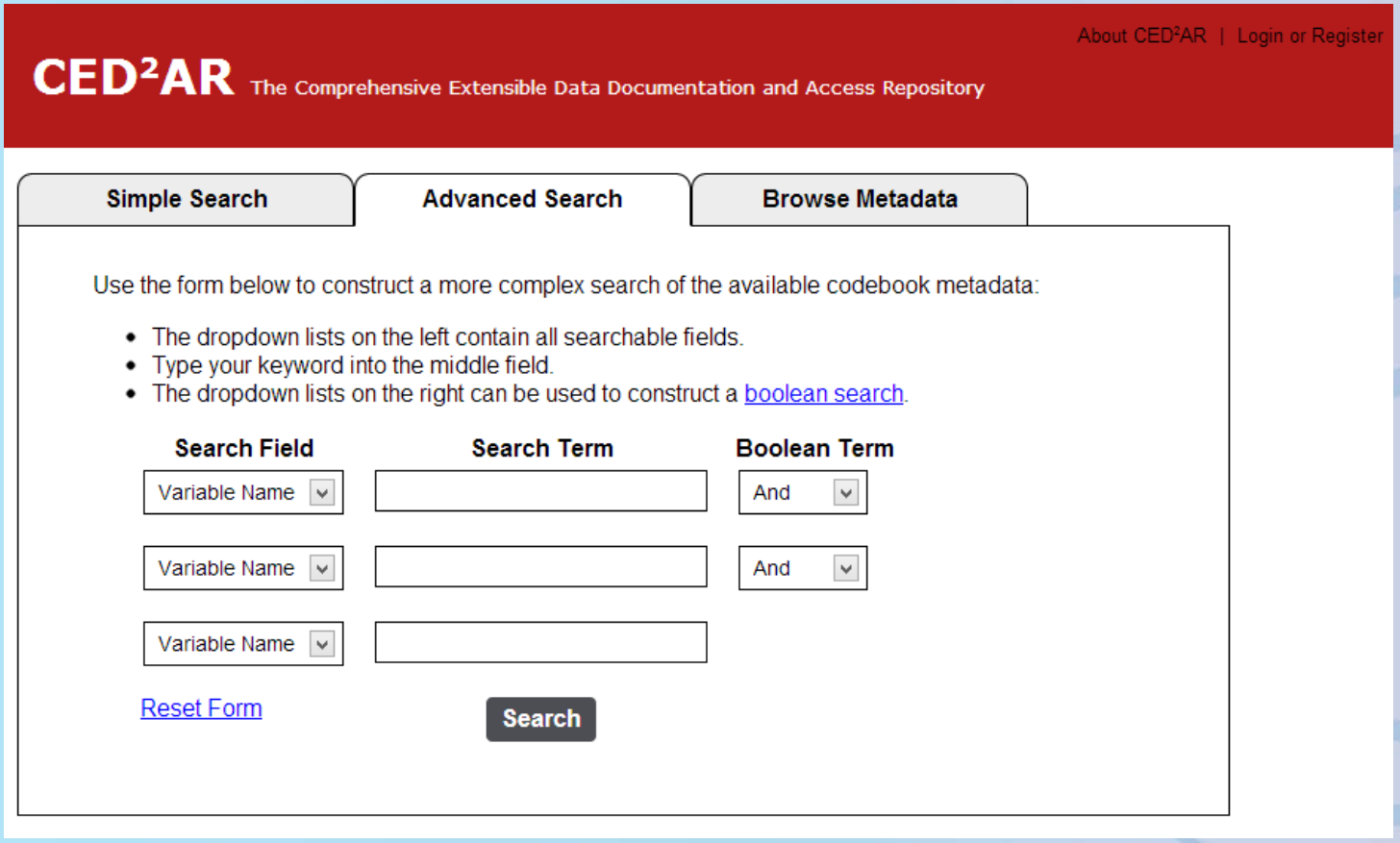
User Interface – Advanced Search



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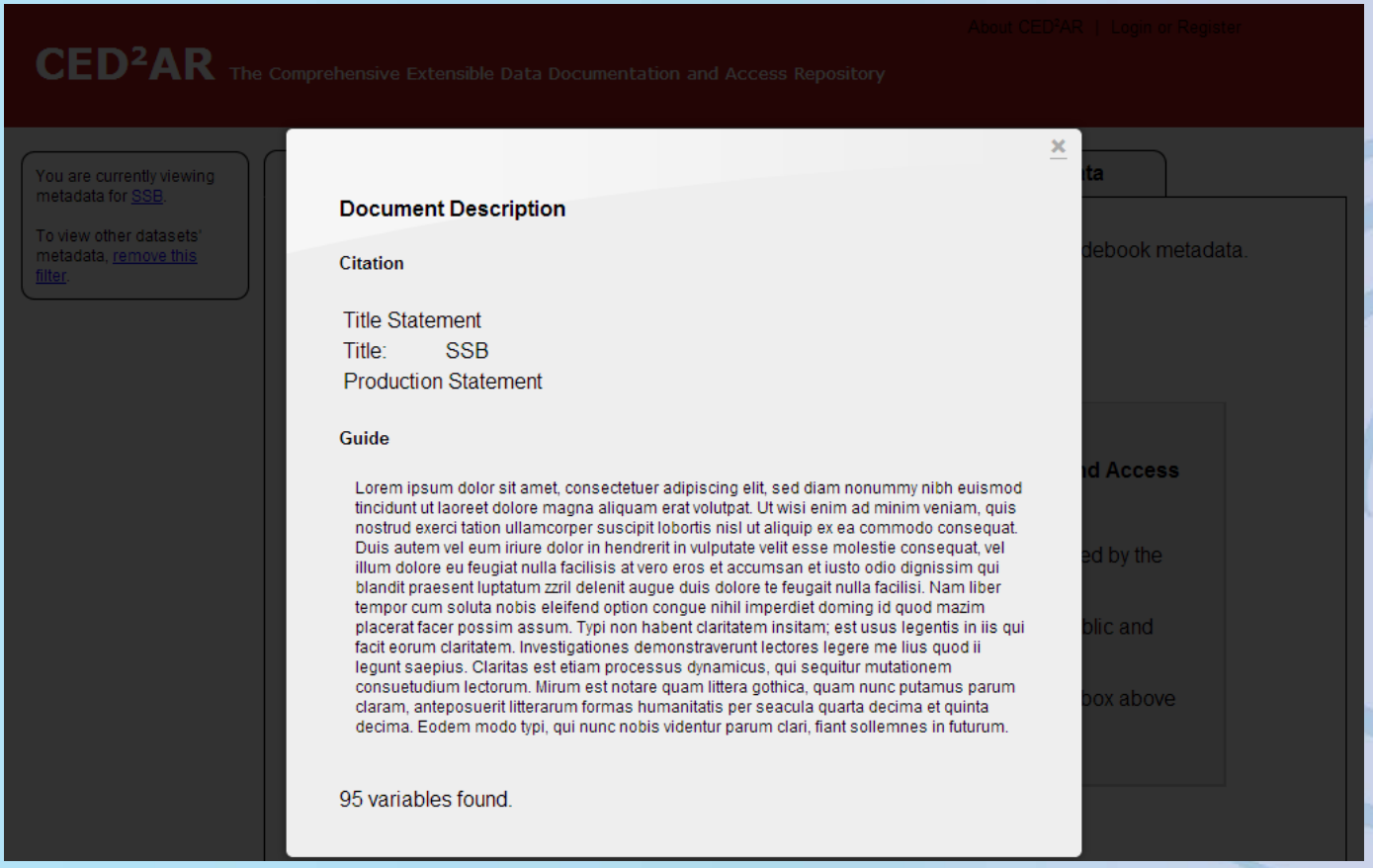
User Interface – Dataset-specific view



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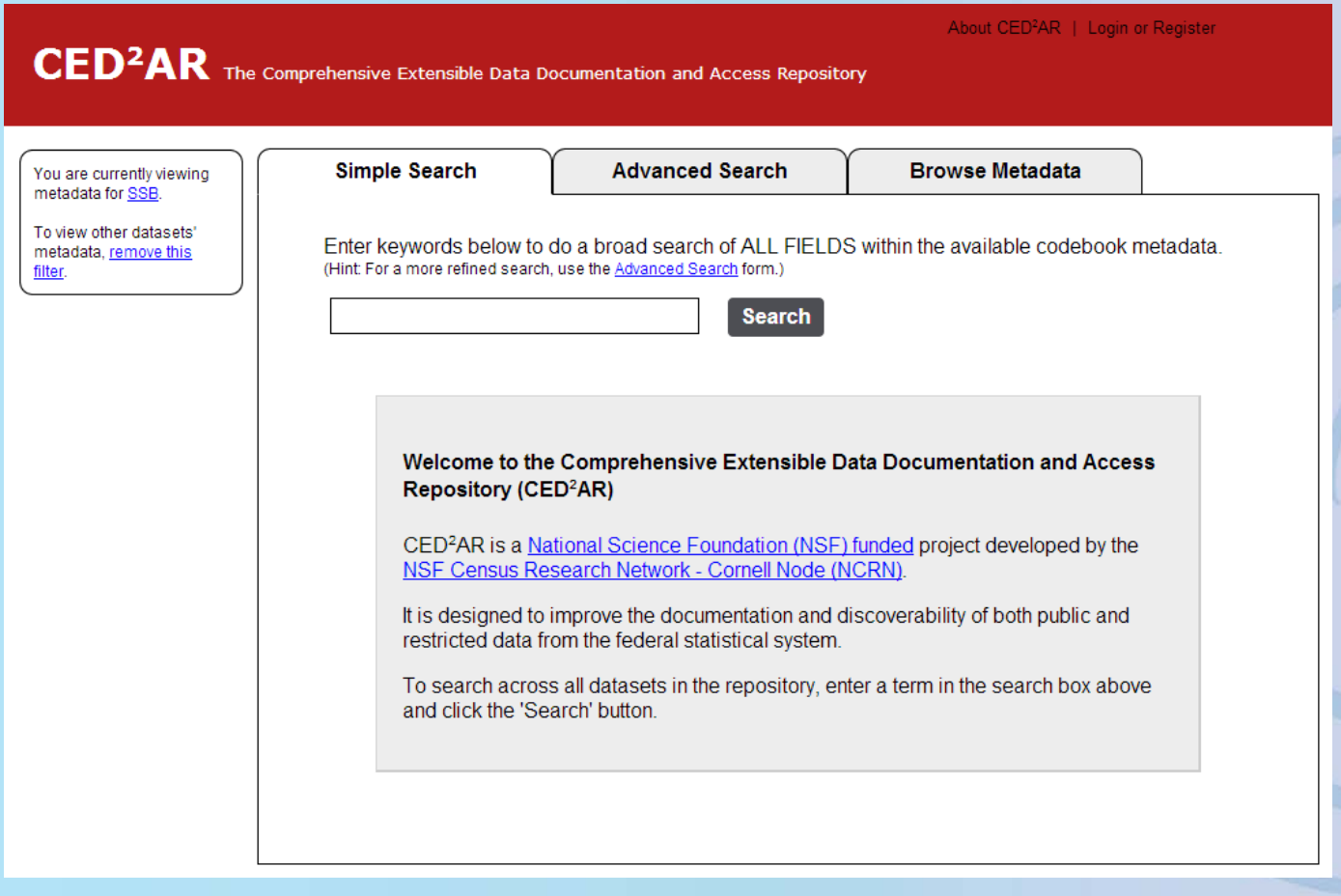
User Interface – Dataset-specific view



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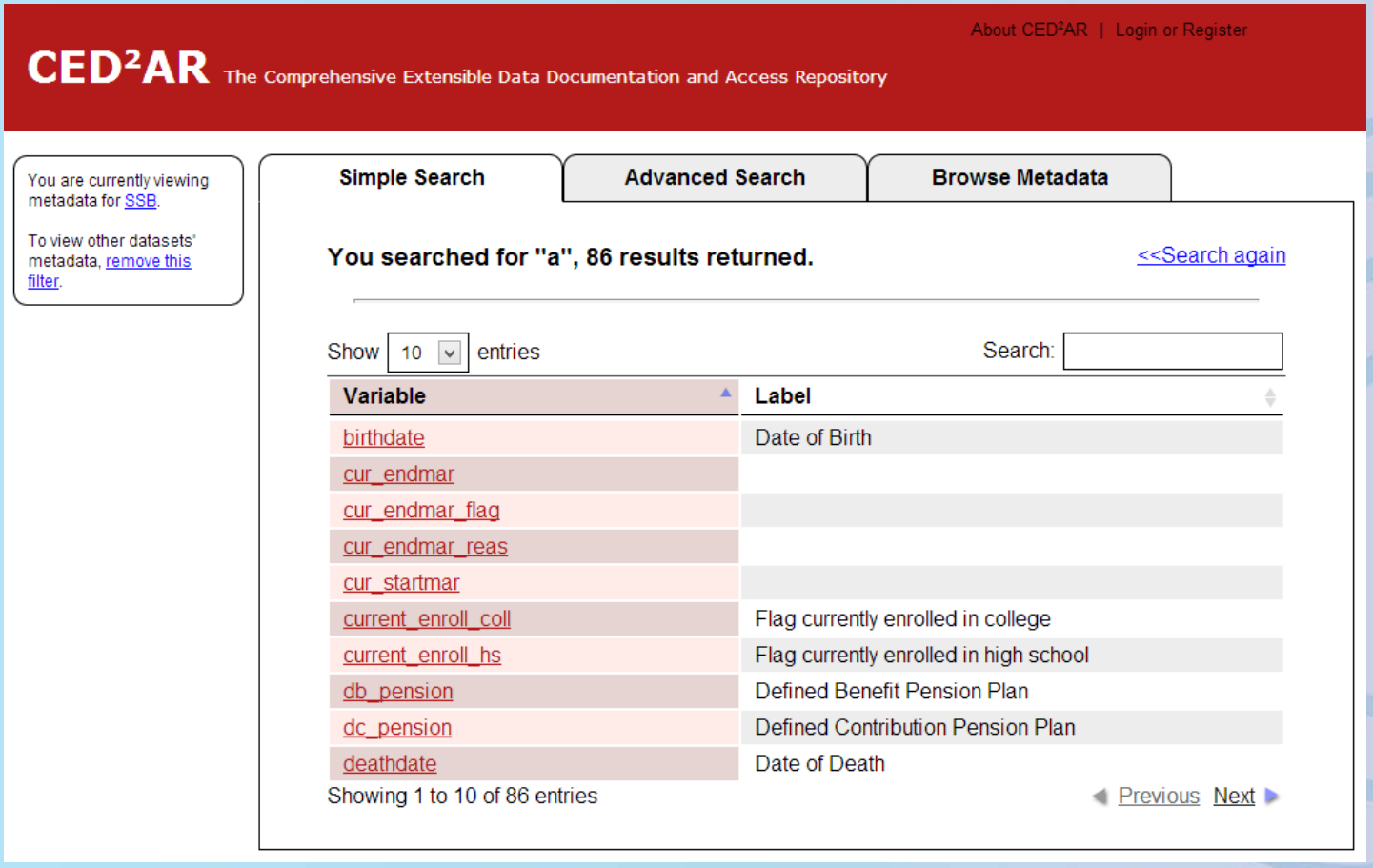
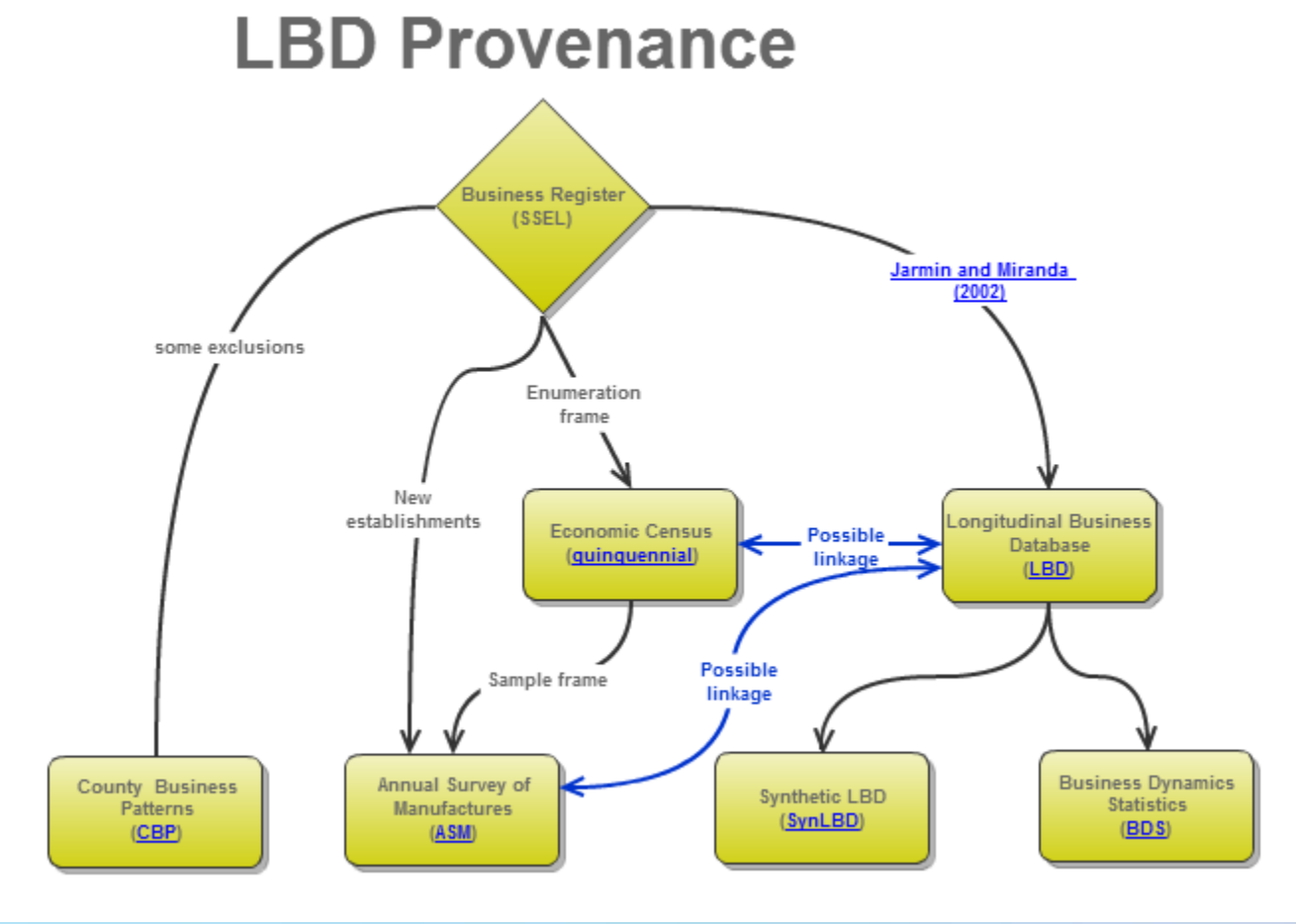
User Interface – Search results



Future Features

- Backend
  - Additional data sources
  - Generic metadata ingest mechanism from finite set of statistical applications
- API
  - OAI-PMH compliance
  - Support for more of the DDI schema
- Web Application
  - More robust filtering (i.e.: by variable group, date, etc..,)
  - Variable groups added to search results
  - Export search results
- System Wide
  - Features to support the storage, exploration and discover of the provenance of variables, datasets, etc..,

The Problem of Provenance



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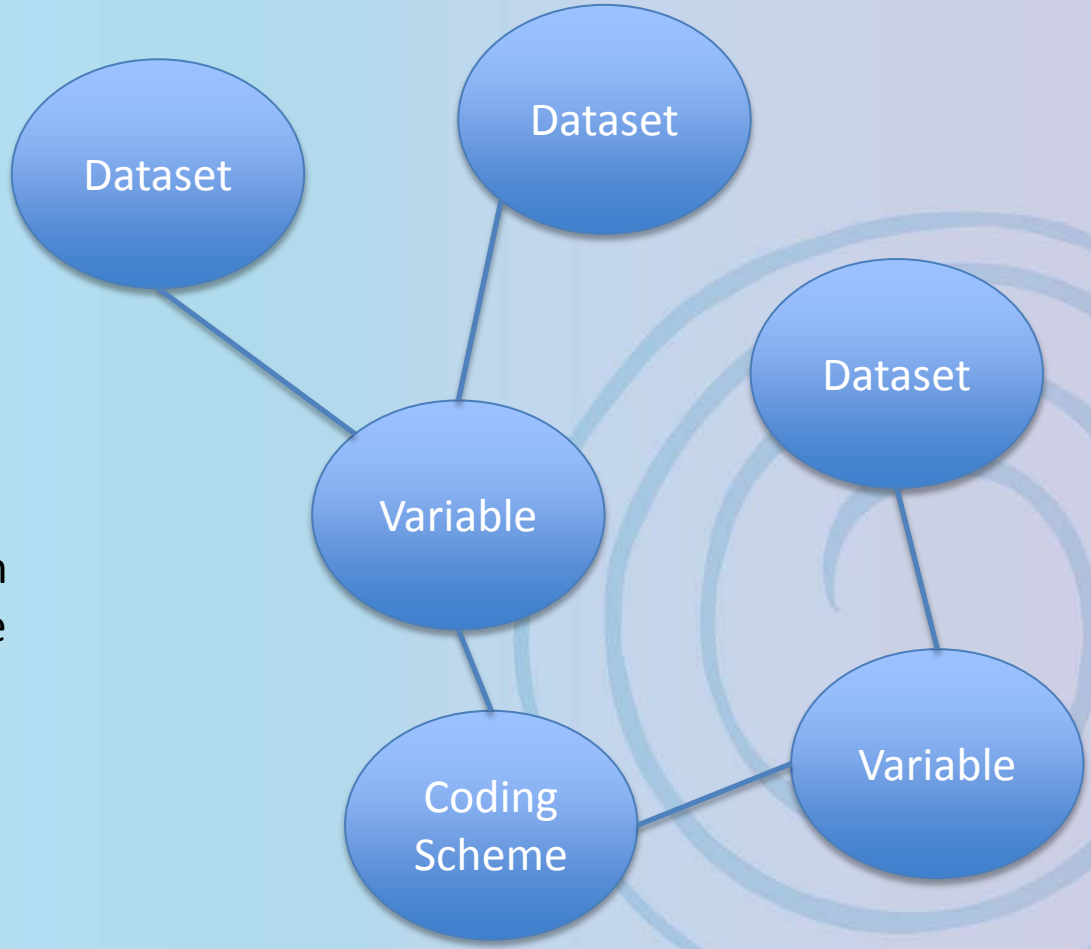
Controlled Provenance Vocabulary; RDF Triples

Graph structure lends itself well to managing and querying provenance.

Developing a controlled vocabulary to describe these relationships, then storing the data as RDF triples is one possible approach.



Future NCRN Work

- Deploy to a Census Research Data Center
  - Automate where possible
- Provide process by which metadata can be enhanced
  - Existing tools
  - Home grown programs
- Provenance solution
  - Embed known relationships within metadata
  - Algorithmically determine similarity (dataset level; variable level)