Utilizing NCBO Tools to Develop & Use an ECG Ontology

Stephen J. Granite, MS, MBA
The Johns Hopkins University
Institute for Computational Medicine
(sgranite at jhu dot edu)

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The CardioVascular Research Grid (CVRG)

- CVRG = a ***community resource*** for the ***distributed management***, ***semantic description***, ***federation***, and ***analysis*** of ***both primary*** and ***derived*** CV data
- CVRG is
  - developing new CV-specific data management resources
  - delivering CV data analysis tools and customized workflows
  - creating easy to use, customized interfaces for accessing its resources
  - providing these resources in a secure manner

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Ontology Development: Use & Extension of NCBO/NCI/BIRN Tools

- Strategy
  - When applicable, use existing ontologies from:
    - the Biomedical Informatics Research Network (BIRN)
    - the cancer Biomedical Informatics Grid (caBIG)
    - the National Center for Biomedical Ontologies (NCBO)
  - Develop new concepts that are of special importance in CV research
- Deposit new CV ontologies at the NCBO
- Work to harmonize terms with the NCI Thesaurus/Meta-Thesaurus as needed

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CVRG-NCBO Driving Biological Project (DBP)

- Use NCBO tools (Protégé, BioPortal 2.0) to develop, manage & access a comprehensive ECG ontology
  - Original plan:
    - Use BioPortal to find pre-existing concepts (and their ontology)
    - Use Protégé to develop the ECG ontology
      - Load other ontologies into Protégé, to use their concepts without having to transcribe them
    - Use BioPortal to store and manage the ontology
  - New plan:
    - **Develop a tool to utilize BioPortal's Representational State Transfer (REST) services, to obtain pre-existing ECG concepts & definitions and export them in OWL**
    - Use Protégé to extend the ontology with novel ECG concepts
    - Use BioPortal to store and manage the ontology

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Benefits of the tool

- Concept Provenance
  - Cites source of the concept & definition, providing a timedatestamp for the information capture
- Obtains a subset of pre-existing ontologies quickly
  - Original plan required importing entire ontologies to use just a few concepts
    - Foundational Model of Anatomy (FMA)
      - Anatomical structure concepts
    - National Cancer Institute (NCI) Thesaurus
      - EKG wave concepts
- Enhancement of concept mapping to pre-existing ontologies
  - Concepts and definitions match exactly, making mapping easy & automatable

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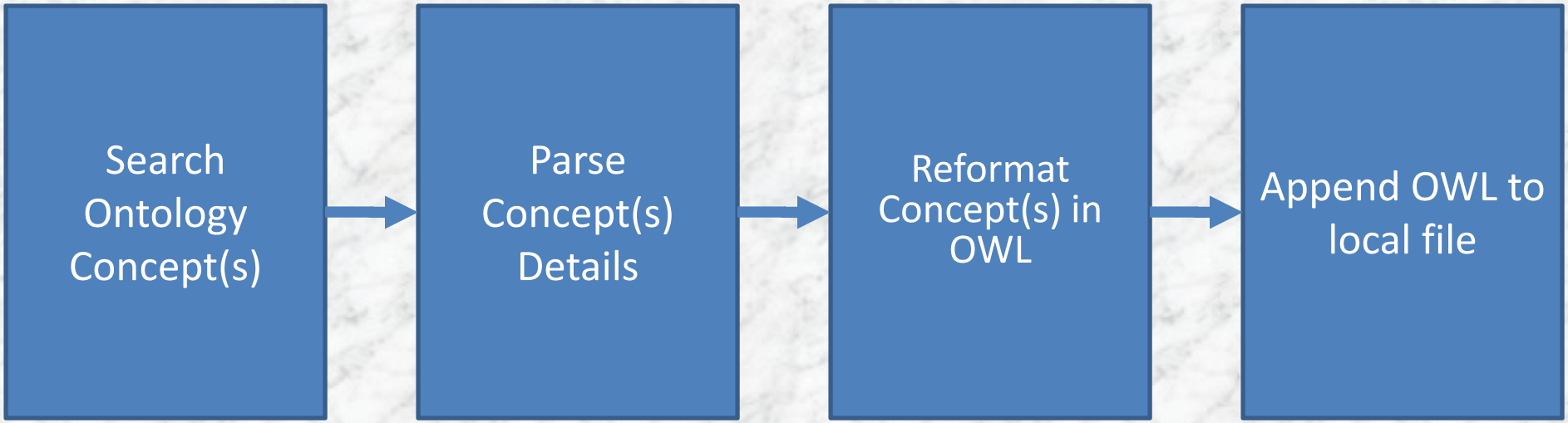
Design


Search Ontology Concept(s)
Parse Concept(s) Details
Reformat Concept(s) in OWL
Append OWL to local file

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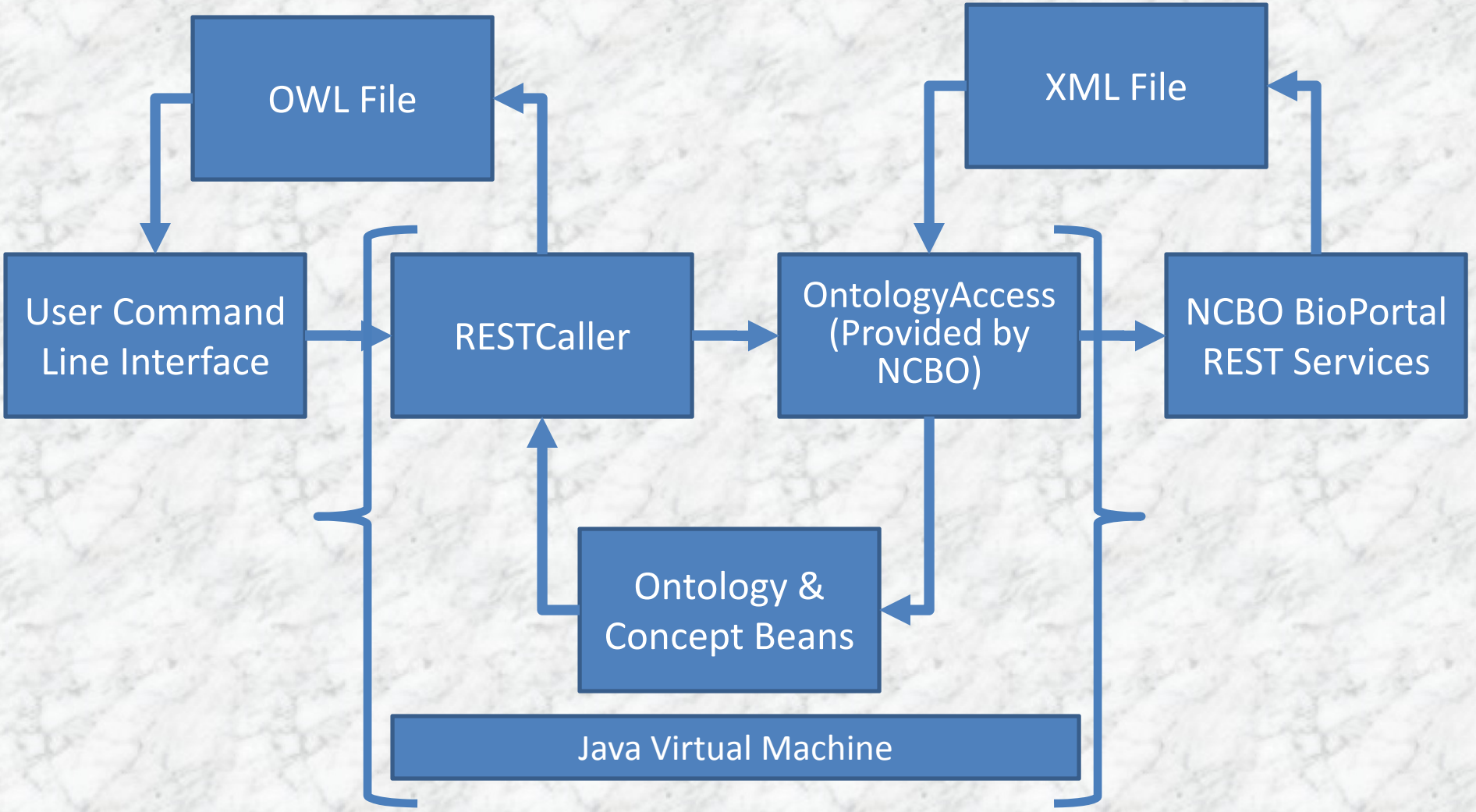
Latest Implementation



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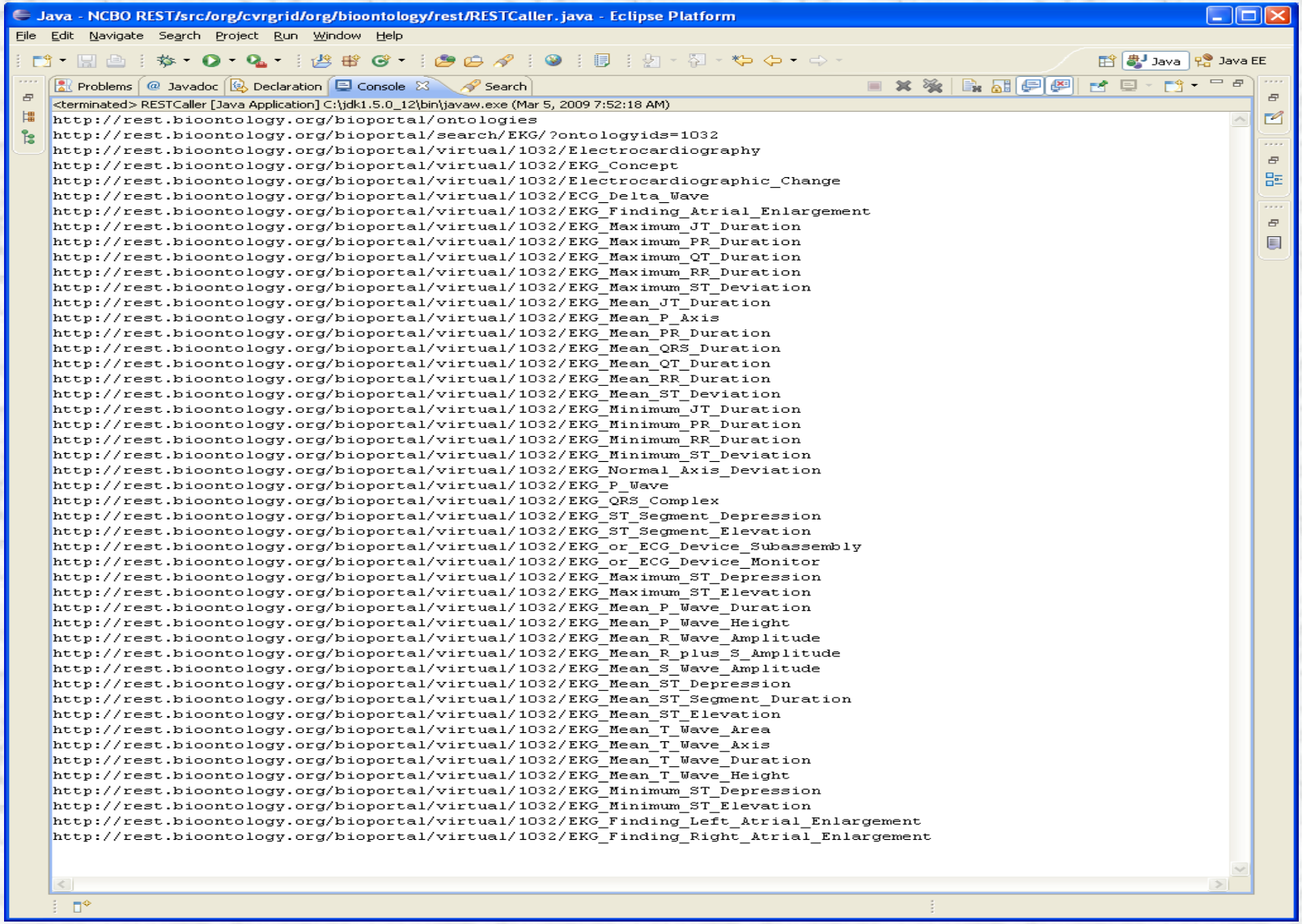
Use Case – search "EKG" in NCI Thesaurus



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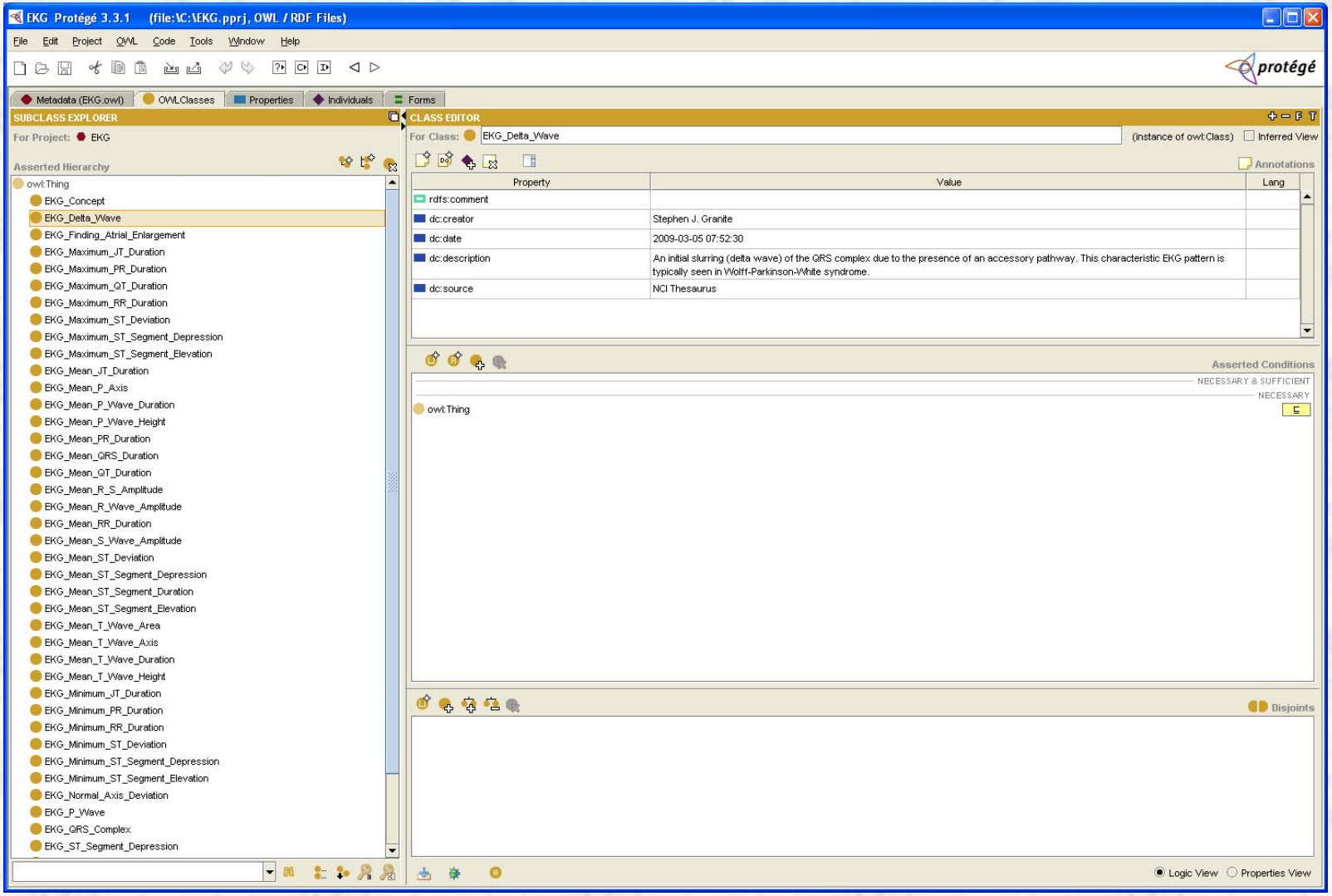
Use Case Results



http://bioportal.bioontology.org/visualize/40144

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Future Development

- Development of a GUI interface
  - Current interface = single ontology command line search tool
  - GUI interface allows user to search multiple ontologies and save their search parameters
- Utilize the Protégé OWL API
  - Current interface utilizes OntologyAccess API, but not OWL API
  - OWL API would assist in preserving the hierarchical structure of concepts returned from the NCBO BioPortal REST services

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Using the ECG Ontology: CVRG ECG Web Interface

- Prototype ECG Widget
  - Leverages Google Web Toolkit (GWT; http://code.google.com/webtoolkit/)
  - Leverages Google Visualization API (http://code.google.com/apis/visualization/)
  - Can exist in a portal, a web page, a dashboard, a flash drive and/or a handheld device (e.g. G3 phone)
    - Expands avenues of access to the tool, “putting it in the hands of the users”
    - Functions on multiple platforms and multiple browsers
  - Can internationalize the tools developed without requiring additional code

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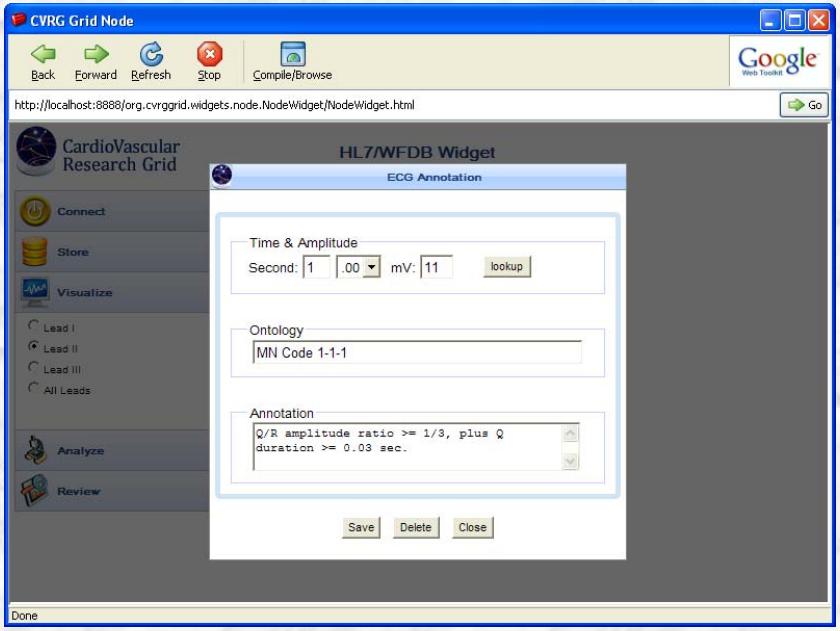
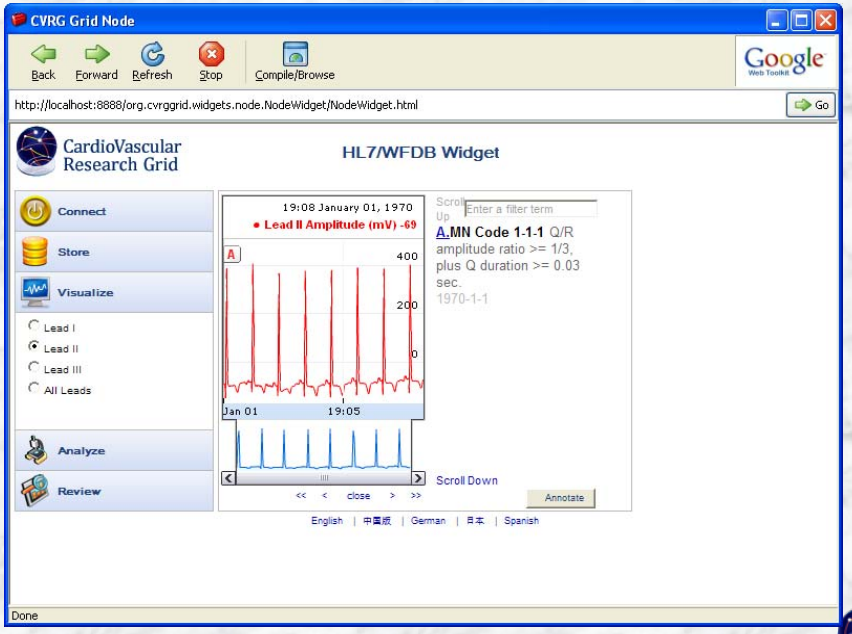
Web Interface Functionality

- Functionality implemented:
  - Integrates the ECG workflows into one unified workflow
    - Accepts ECG formats workflows processed and stores in one format
    - Allows for in-memory translation to other formats
  - Extends the capability of scrolling visualization of the ECG
    - Allows for annotation within the waveform, leveraging NCBO REST Services real-time





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CVRG NCBO DBP Web Resources

- **CVRG Website** – Information about the CVRG (http://www.cvrgrid.org/)
- **NCBO DBP Tool** – Project information and source code available via JHU ICM gForge site (http://gforge.icm.jhu.edu/gf/projects/ncbo_dbp/)

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- Protégé
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Questions and Discussion