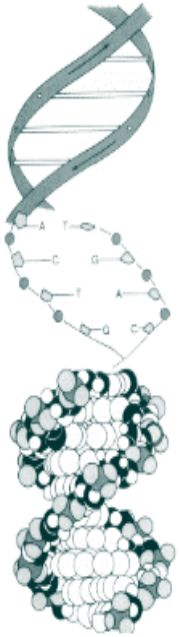


i2b2 Clinical Research Chart

Shawn Murphy MD, Ph.D.
Griffin Weber MD, Ph.D.
Michael Mendis
Andrew McMurry
Vivian Gainer MS
Lori Phillips MS
Rajesh Kuttan
Wensong Pan MS
Henry Chueh MD
Susanne Churchill Ph.D.
John Glaser Ph.D.
Isaac Kohane MD, Ph.D.

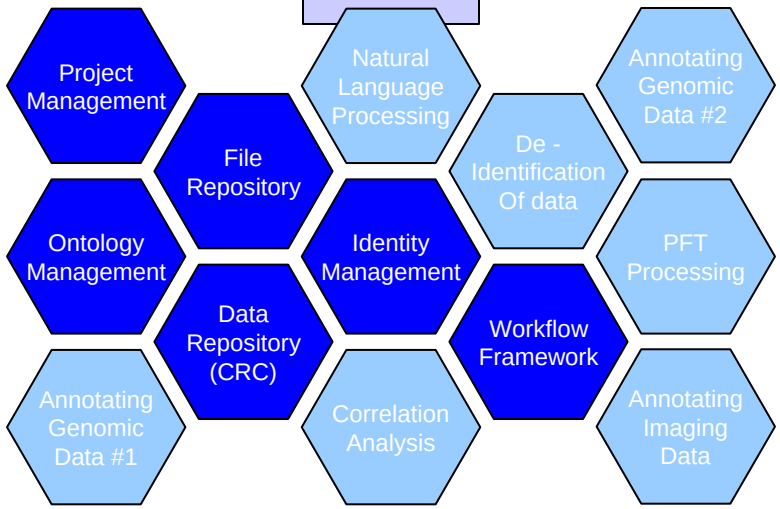
Use Case Development of i2b2 technology

Enterprise-wide repurposing and distribution of medical record data for research

- Hospital-wide availability of clinician-driven queries to find research cohorts
- Suggestion of novel relationships between genes and disease through mutual information theory methods
- Display of large collections of odds ratios as calculated following environmental exposures (Pharmacovigilance)

- IDENTITY MANAGEMENT
- CRC ANALYSIS PLUG-IN

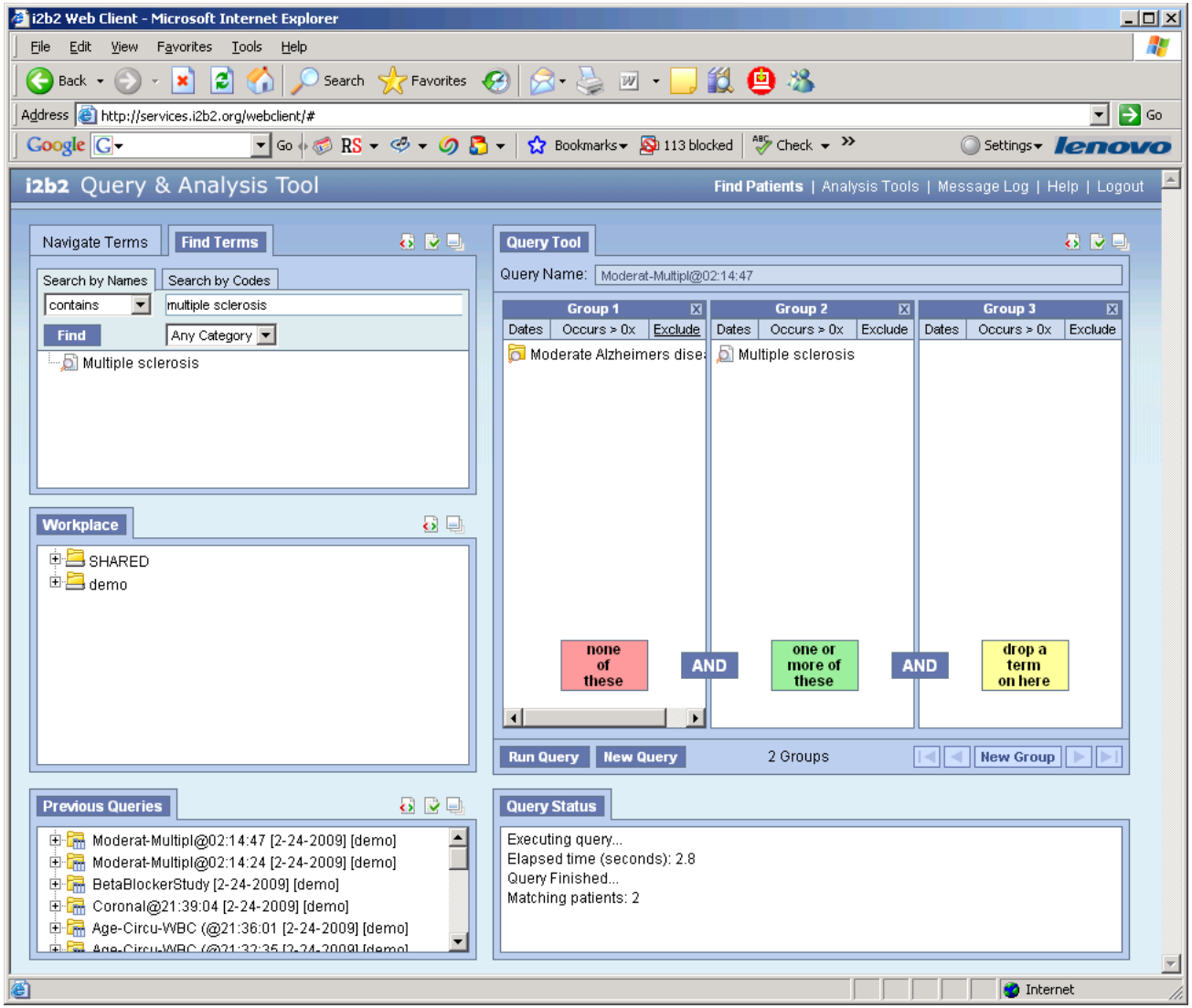
Enterprise-wide repurposing and distribution of medical record data for research



- Enable high performance collection of medical record data for querying and distribution
  - Enterprise web client
  - Create patient cohorts for further investigation
- Enable discovery within data on enterprise wide scale
  - Relevance networks
  - Pharmacovigilance

Enterprise web client

http://services.i2b2.org/webclient/



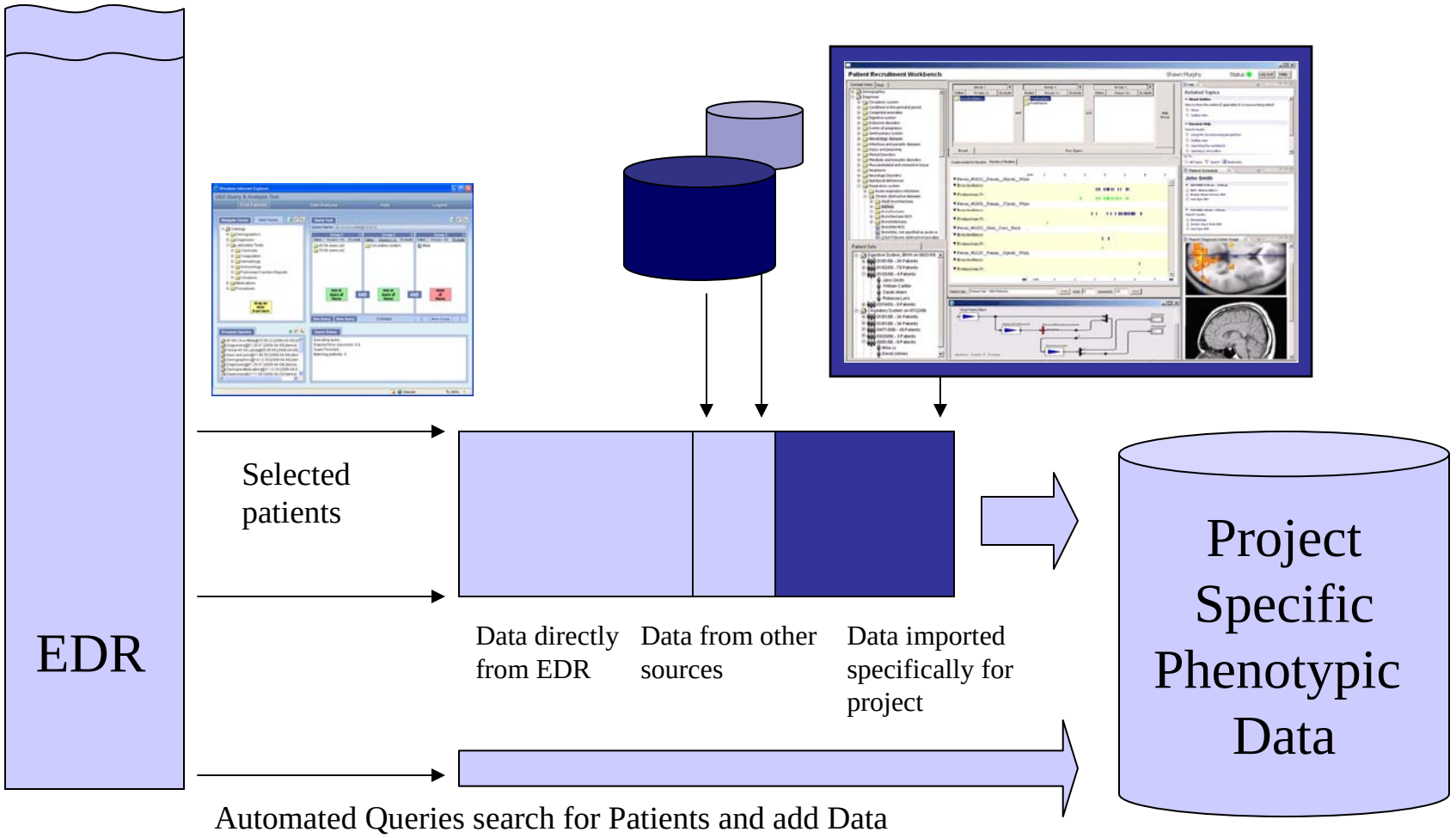
Use Case Development of i2b2 technology

Provide distribution of medical records and tools for their manipulation in supporting specific research projects.

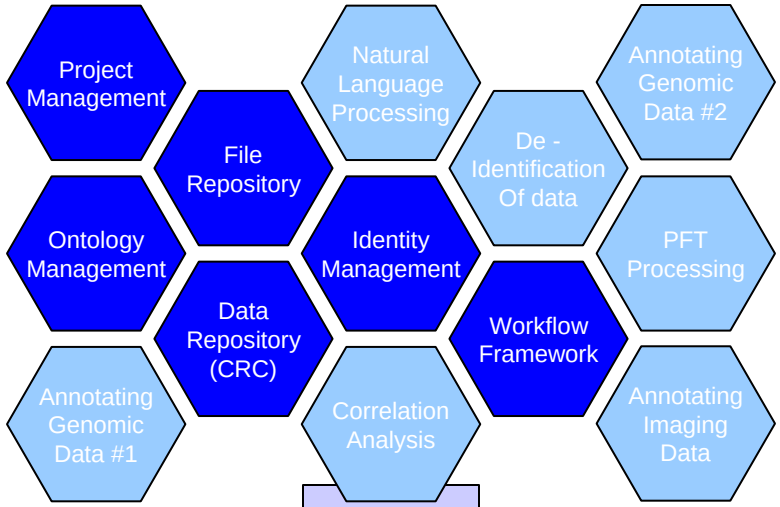
- Select patients for clinical trials
- Working out details for calculating odds ratios of pharmacovigilance
- Annotating images in clinical studies

- NLP WORKFLOW SUPPORT
- CRC ANALYSIS PLUG-IN

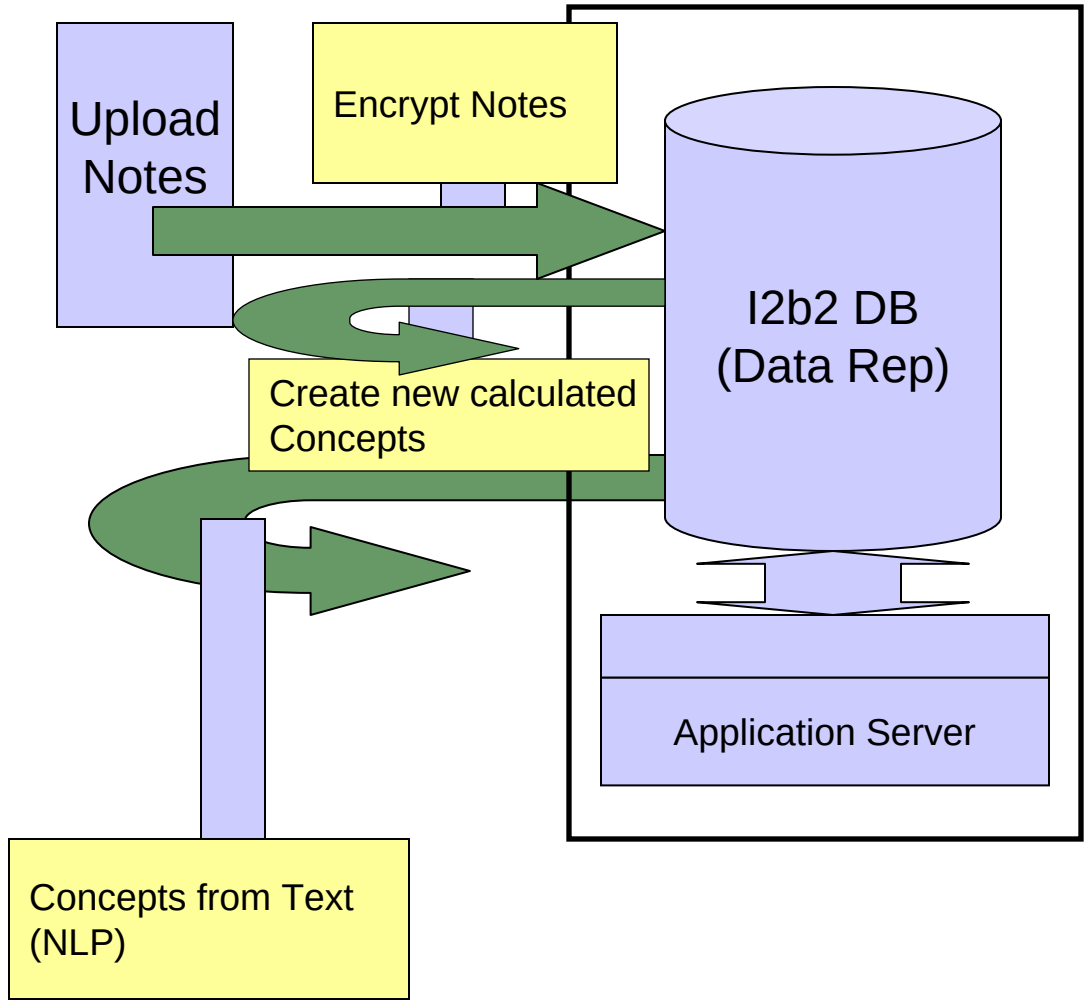
Set of patients is selected through Enterprise Repository and data is gathered into a data mart



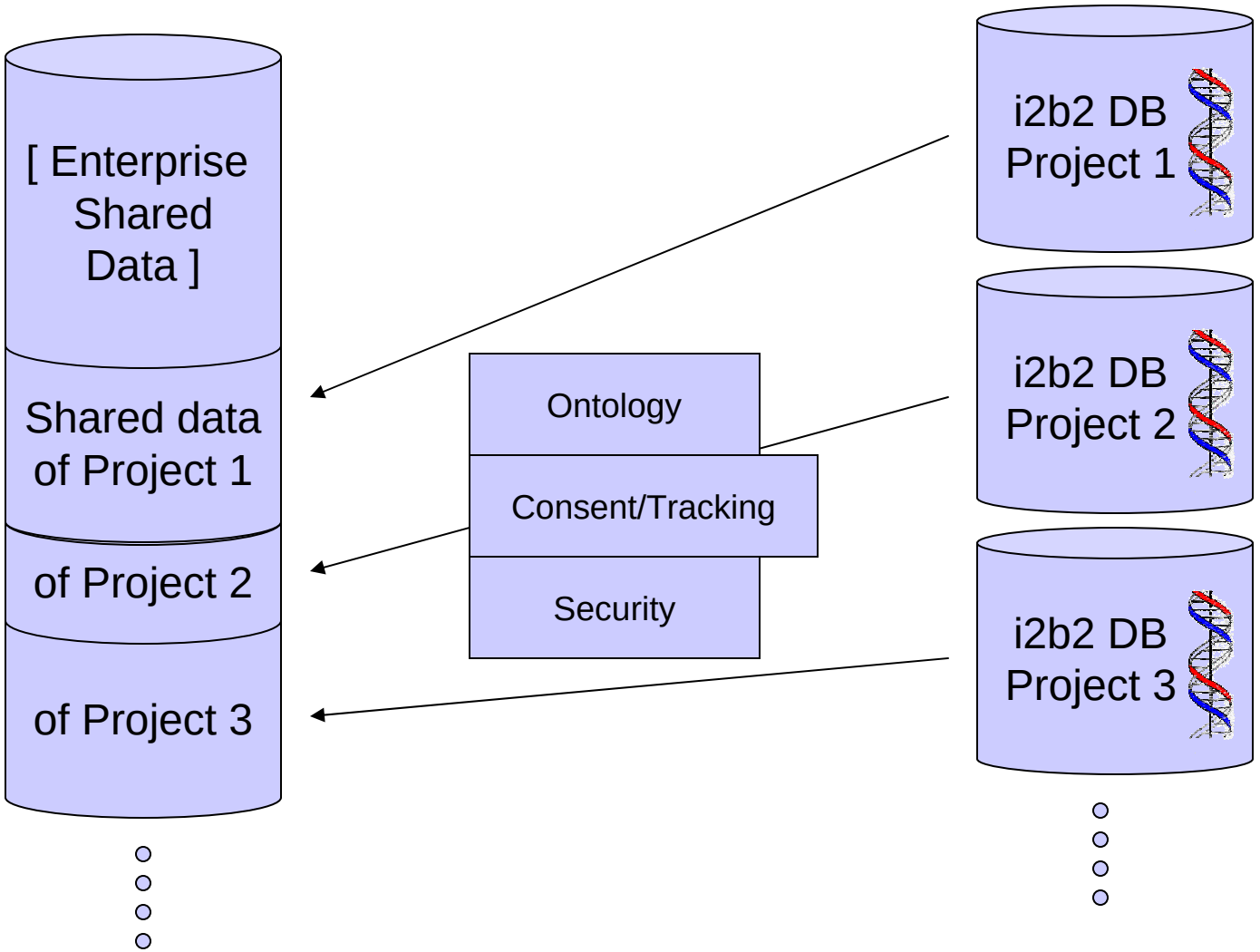
- Repurpose medical record information for research studies
  - I2b2 Workbench
  - Natural language processing
- Enable genomic studies
  - Tissue/blood selection
  - Genetic data integration



Use of medical record data in clinical studies focused upon genomics and pharmacology


Upload Notes
Encrypt Notes
I2b2 DB (Data Rep)
Create new calculated Concepts
Application Server
Concepts from Text (NLP)

Project data can be added back to Enterprise Repository

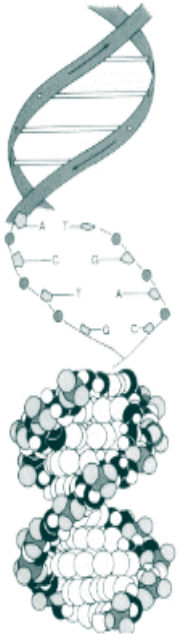


Enterprise Querytool allows:

- Selection of patient populations through complex queries
- Specifically targeted population analysis
- Privacy Management

Project Workbench allows:

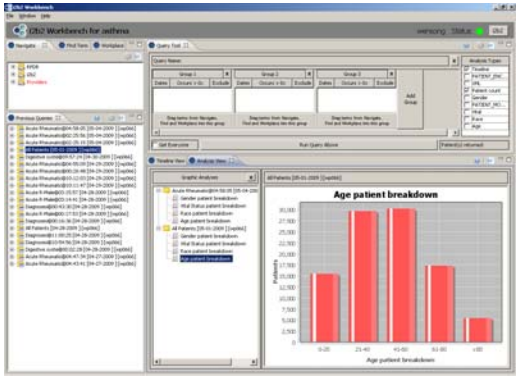
- Patient population medical record review and exploration of data in a targeted population
- Use of Natural Language Processing
- Import of batch data sets
- Workflow support to simulate sequences of operations
- Export of batch outputs for specific applications
- Privacy management



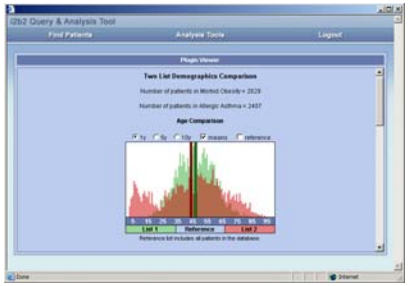
CRC Analysis Plug-in

Use of CRC Analysis Plug-ins

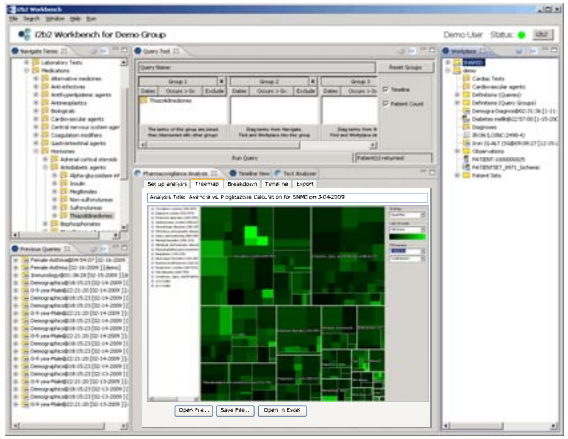
- Breakdowns of patient attributes



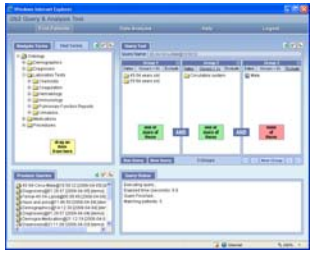
- Two group comparisons

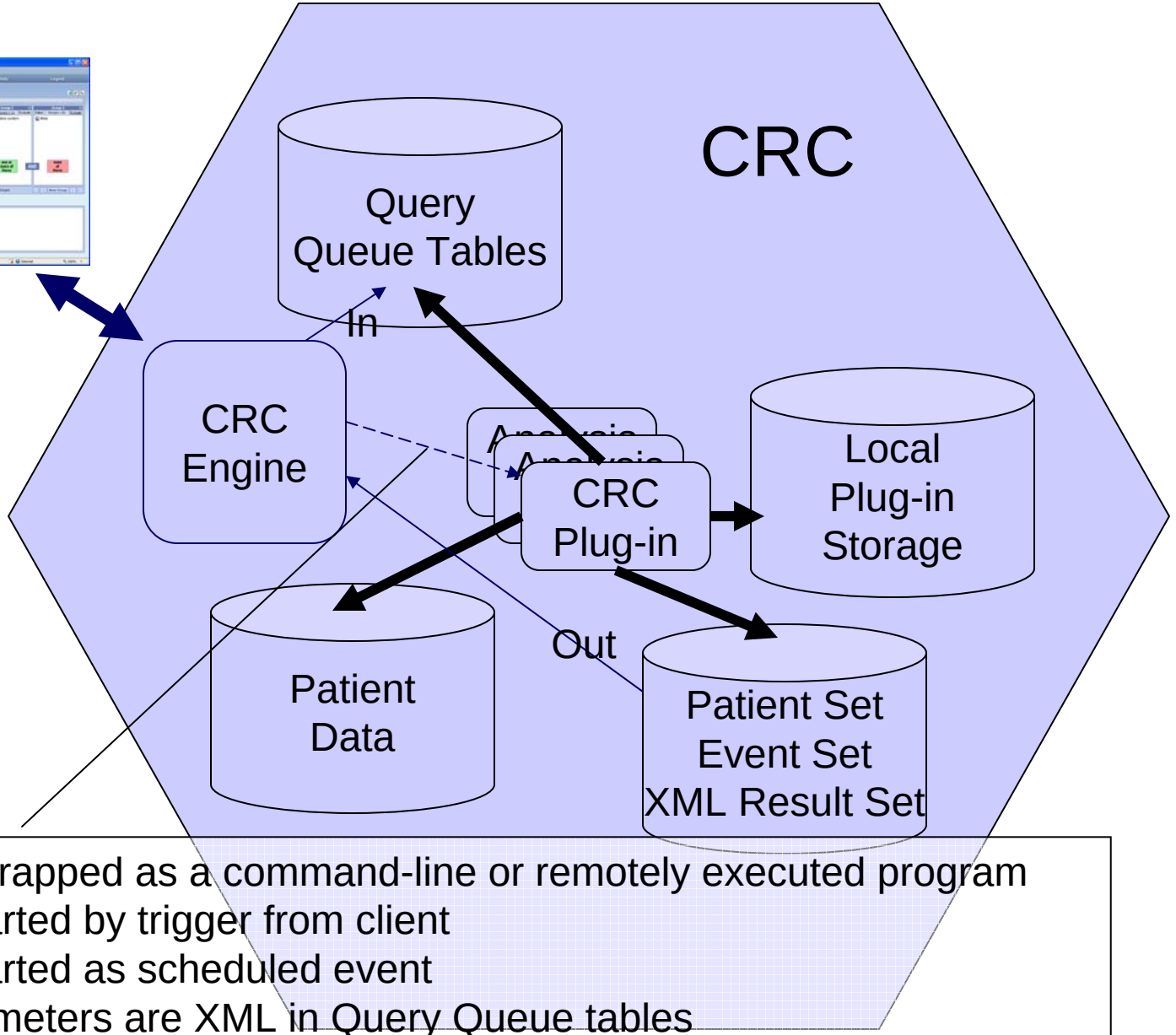


- Increasingly complex types of analyses



Client





Analysis wrapped as a command-line or remotely executed program
Can be started by trigger from client
Can be started as scheduled event
Input parameters are XML in Query Queue tables
Output goes to Result tables, may have pointer to Local Plug-in Storage

Process for Adding New Plug-ins

- Register CRC Plug-in with:
  - Unique ID
  - Name
  - Start up process (local vs. remote)
  - Algorithm API Call to establish run time (for Queue management)
  - Any new XML Result Types and Icons

CRC Plug-in Program – Starting-up

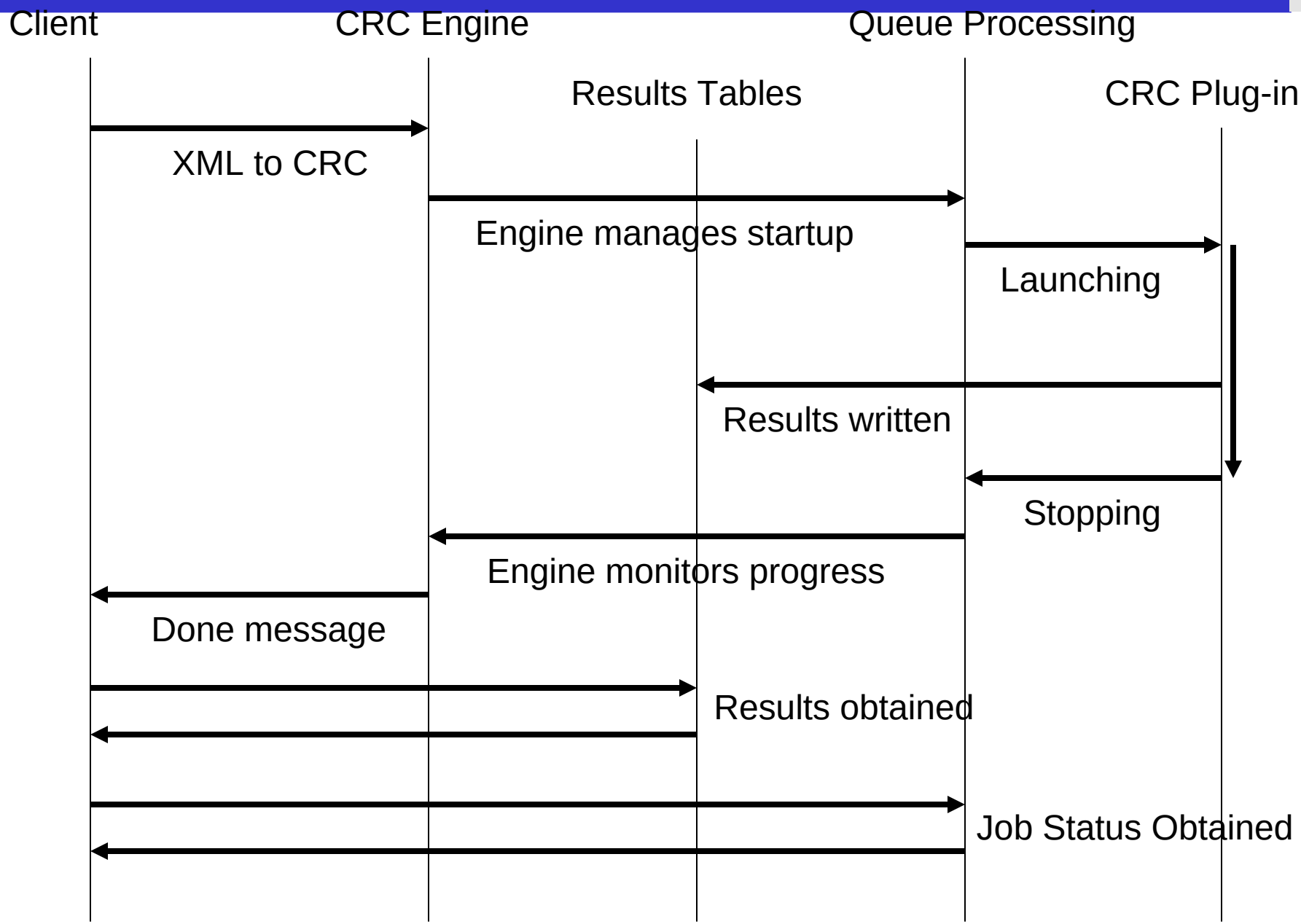
- Client delivers input through web service
- Input from reading block of XML from CRC Query Queue tables, placed there by CRC Engine
- Execution controlled by CRC Engine
- Run from command line (or)
- Run as remote service
- Queue mechanism encourages short running processes to have higher priority

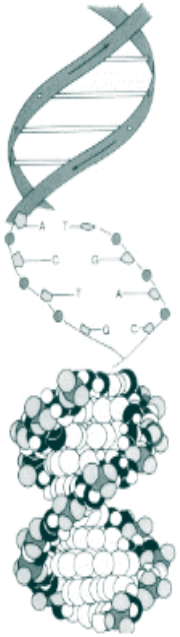
CRC Plug-in Program - Execution

- Access to Patient Data tables through direct SQL
- Local Plug-in Storage database can be persistent storage if desired
- Plug-in manages Local storage

CRC Plug-in Program – Finishing-up

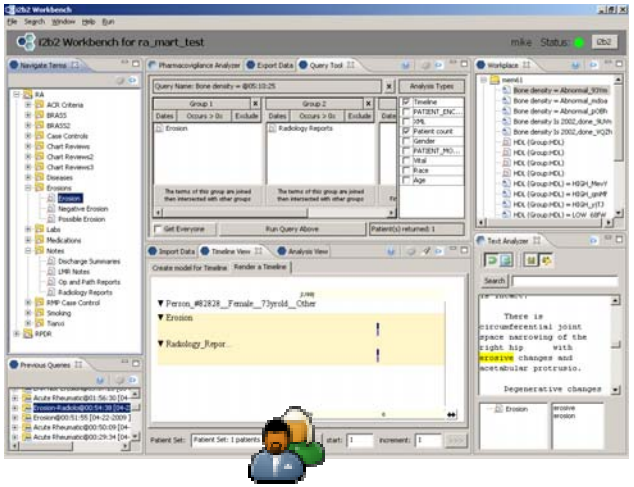
- Output goes to one of three tables
  - Patient Set Table
  - Encounter Set Table
  - XML Results Table
- XML Results Table can have a pointer to a Local Plug-in Database table


Client
CRC Engine
Queue Processing
Results Tables
CRC Plug-in
XML to CRC
Engine manages startup
Launching
Results written
Stopping
Engine monitors progress
Done message
Results obtained
Job Status Obtained



NLP Workflow Support

NLP Workflow Requirements



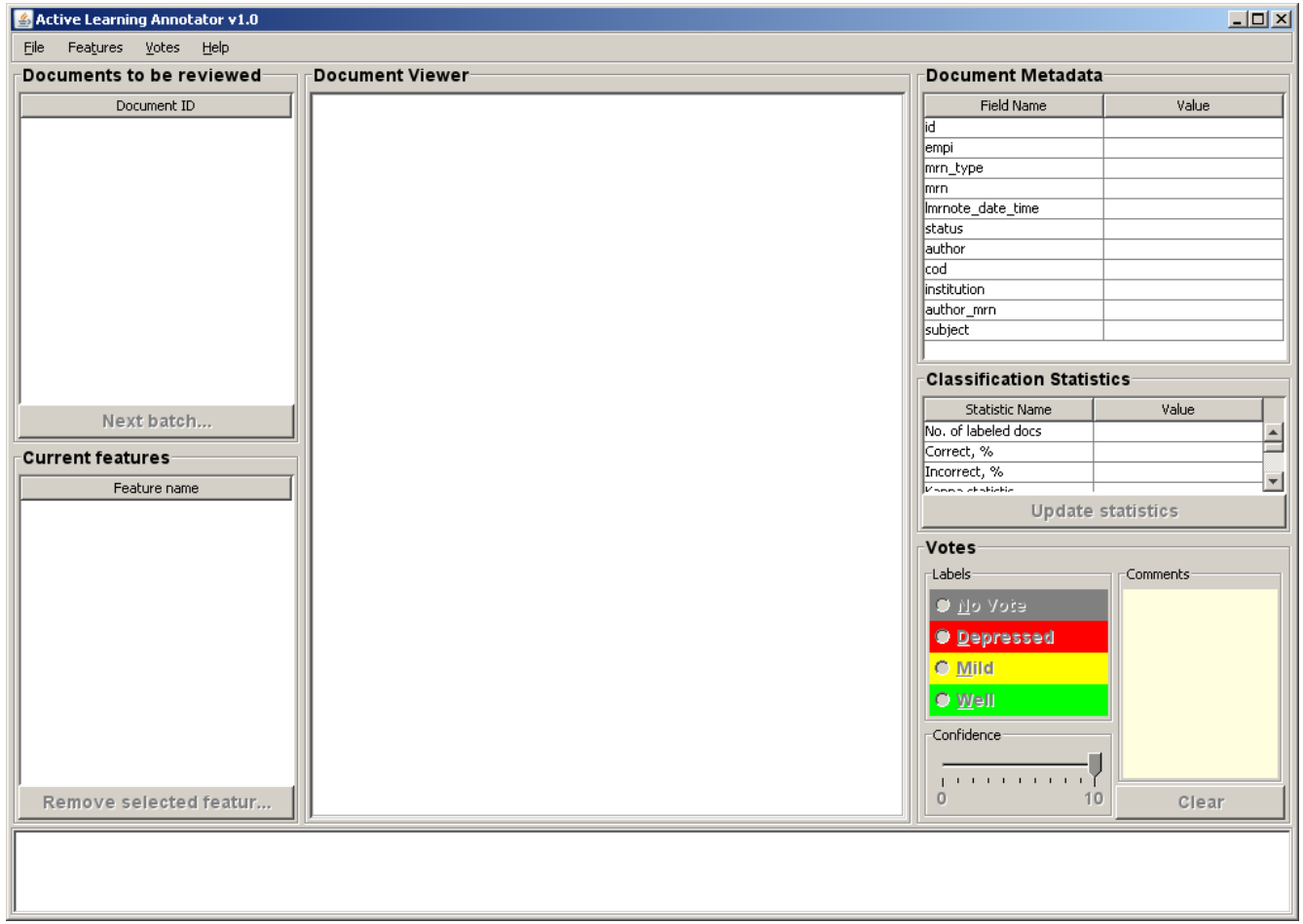
I2b2 Project Investigators

Communication

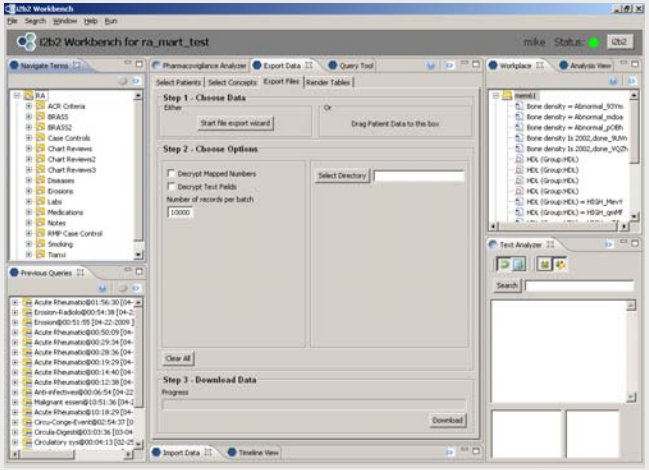
Results Delivery

NLP Specialists

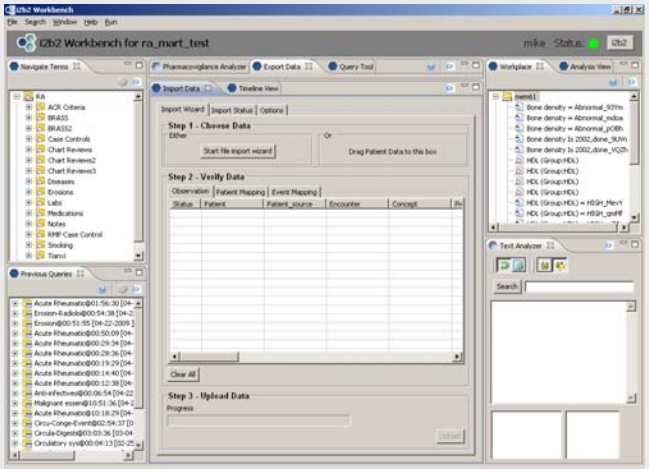
Investigator Annotation



NLP Specialists Workstation



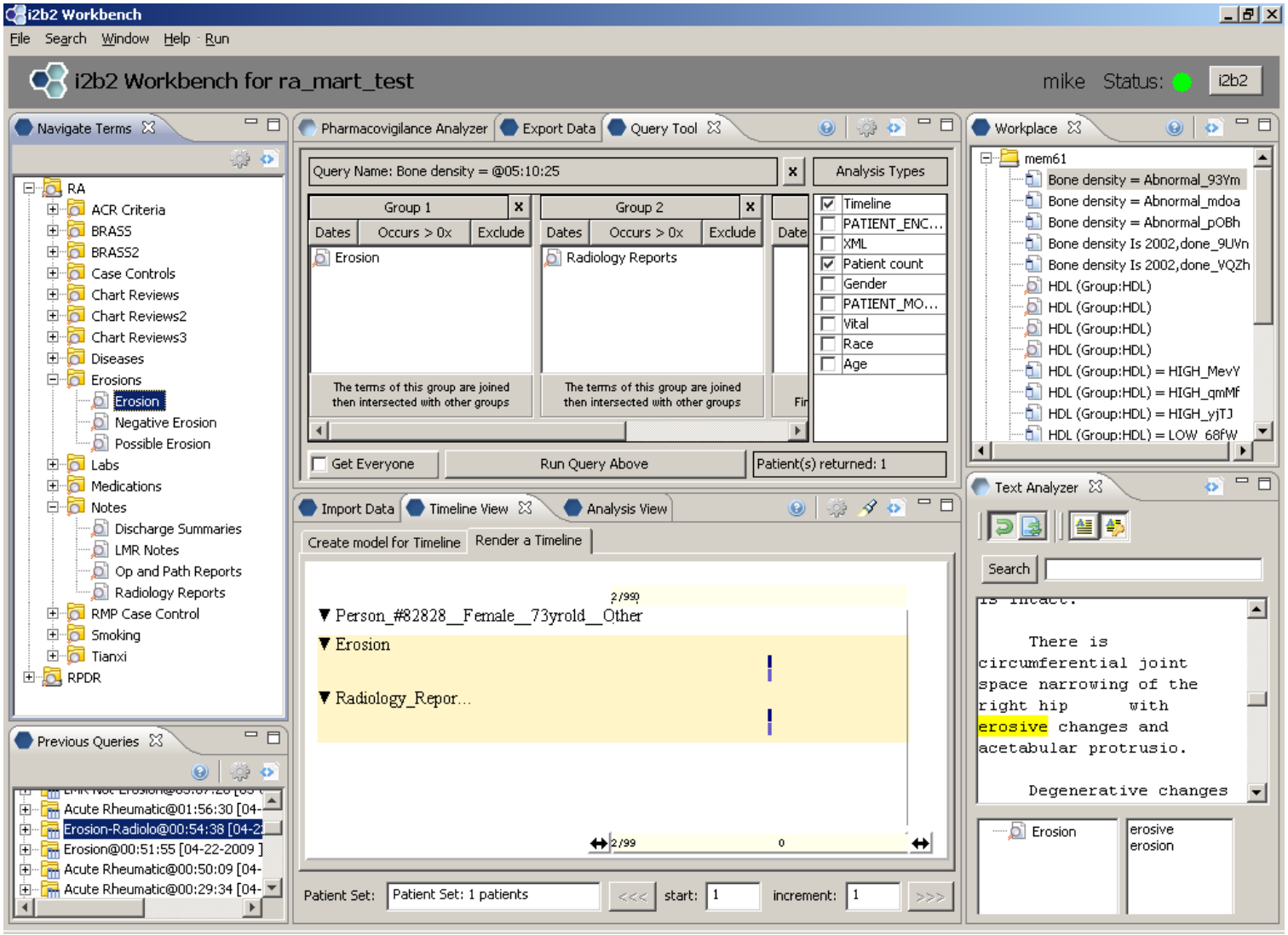
Export Notes

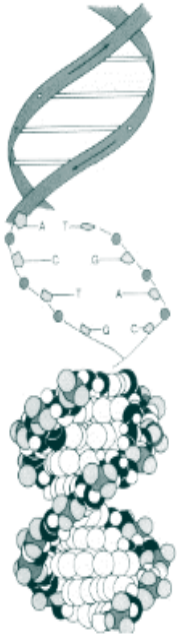


Import Derived Codes

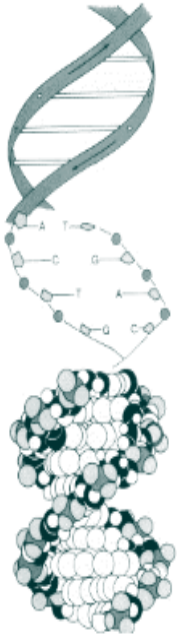
NLP Specialists

Investigator Review

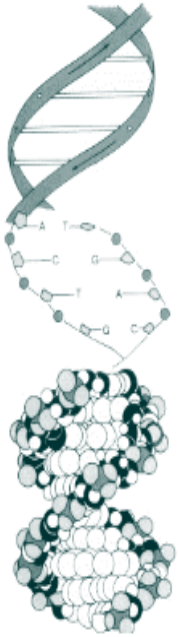




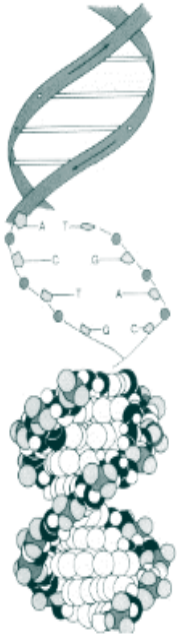
IDENTITY MANAGEMENT PRESENTATION



WEB CLIENT PRESENTATION



JIRA PRESENTATION

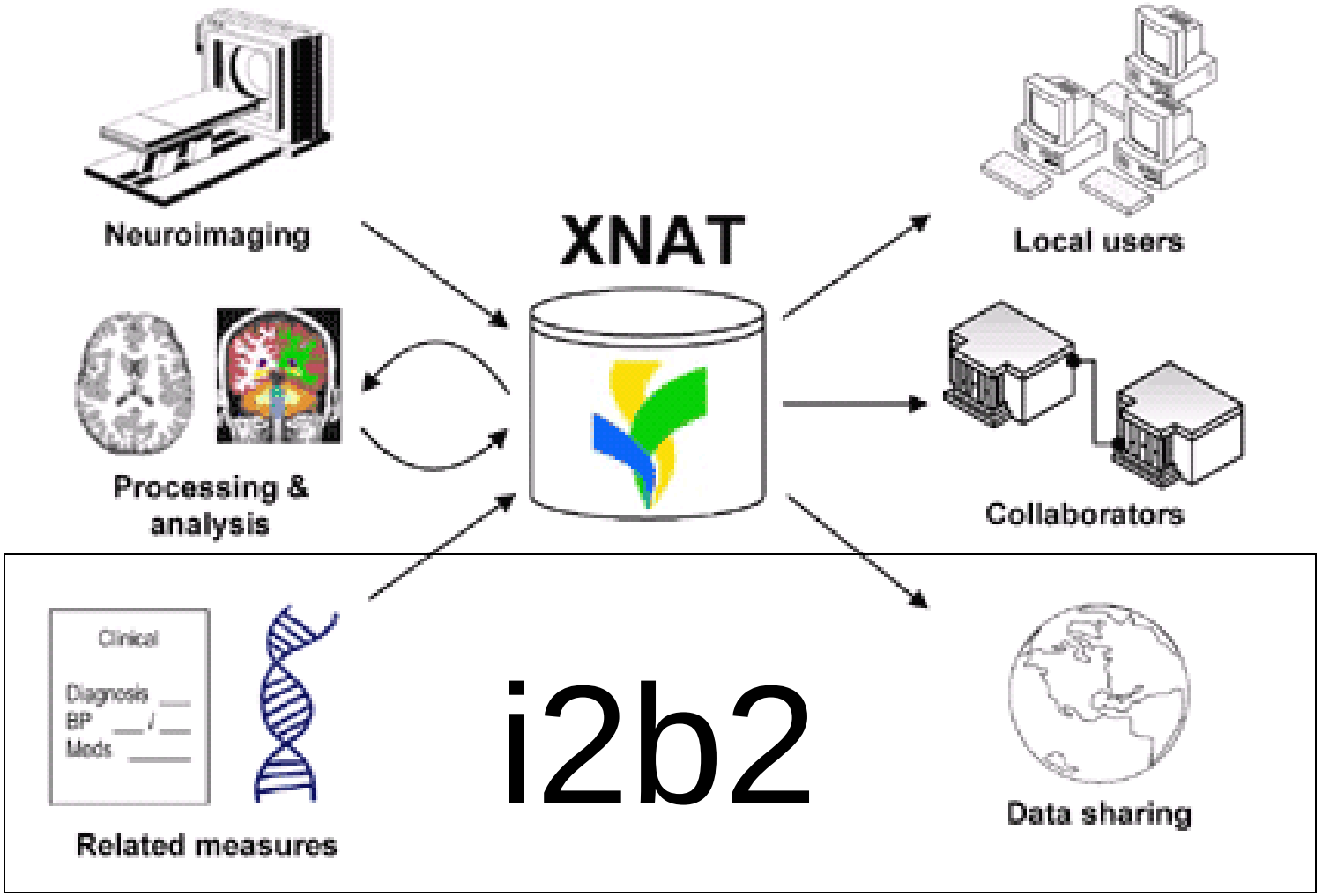


IMPORTANT ACTIVITIES

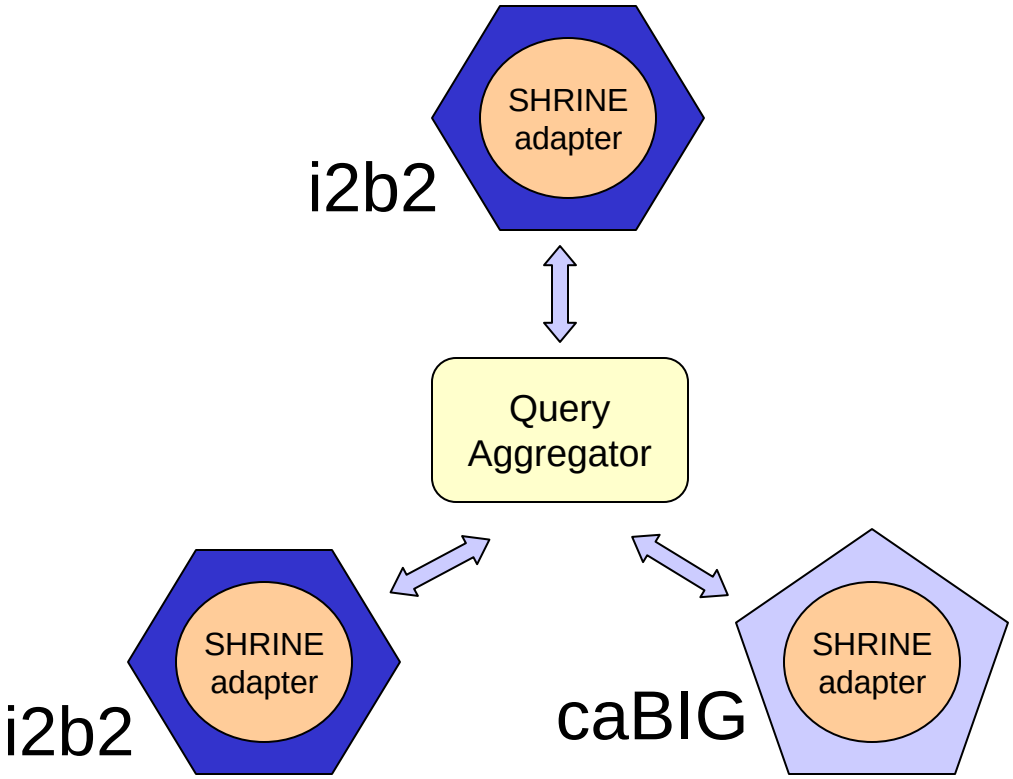
Help outside of i2b2

- Ontology management
  - NCBO
- Imaging Research
  - BIRN / XNAT
- Cross Site and Platform Integration
  - SHRINE / caBIG

Extensible Neuroimaging Archive Toolkit (XNAT) used to integrate image management into i2b2



SHRINE (Shared Research Informatics Network) = Distributed Queries



Central “aggregator” broadcasts query to local hospital “adaptors”, which return aggregate counts only

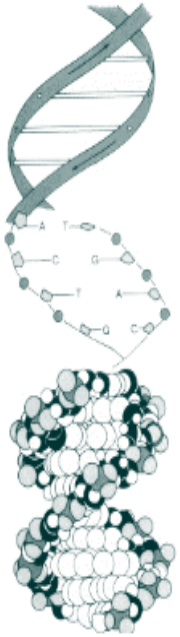
Community

United States

- Beth Israel Deaconness Hospital, Boston, MA
- Boston University School of Medicine, Boston, MA
- Brigham and Women's Hospital, Boston, MA
- Children's Hospital, Boston, MA
- Denver Children's Hospital, Denver, CO
- Cincinnati Children's Hospital, Cincinnati, OH
- Cleveland Clinic, Cleveland, OH
- Weil Medical College of Cornell, NYC, NY
- Group Health Cooperative
- Harvard Medical School, Boston, MA
- Massachusetts General Hospital, Boston, MA
- Maine Medical Center, Portland, ME
- Marshfield Clinic, Wisconsin
- Morehouse School of Medicine, Atlanta, GA
- Oregon Health & Science University, Portland, OR
- Ohio State University Medical Center, Columbus, OH
- Philadelphia Children's Hospital, Philadelphia, PA
- Renaissance Computing Institute, Chapel Hill, NC
- Tufts New England Medical Center, Boston, MA
- University of California Davis, Davis, CA
- University of California San Francisco, SF, CA
- University of Massachusetts Medical School, Worcester, MA
- University of Michigan Medical Center, Ann Arbor, MI
- University of Pennsylvania School of Medicine, Philadelphia, PA
- University of Rochester Medical Center, Rochester, NY
- University of Texas Health Sciences Center Houston, Houston, TX
- University of Texas Health Sciences Center San Antonio, SA, TX
- University of Texas Health Sciences Center Southwestern,
- Utah Health Science Center, Salt Lake City, UT
- University of Washington, Seattle, WA

International

- Georges Pompidous Hospital, Paris, France
- University of Goettingen, Goettingen, Germany
- University of Pavia, Pavia, Italy
- University of Seoul, Seoul, Korea



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