Object Oriented Data Technology (OODT)

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Jet Propulsion Laboratory

- NASA's lead center for robotic exploration of the solar system
- Has a dual character:
  - A unit of Caltech, staffed with Caltech employees;
  - A Federally-Funded Research and Development Center (FFRDC) under NASA sponsorship;
- Is a major national research and development (R&D) center supporting:
  - NASA programs;
  - Defense programs;
  - Civil programs of national importance compatible with JPL capabilities.
- Currently 5500 employees located in Pasadena, CA on 177 Acres

Key Data Management Challenges of NASA Scientists and Engineers

- Search and retrieval of data sets across projects, missions and data centers
- Long term preservation of data
- Distribution of data to scientists
- Data sharing
  - Different formats, systems, access methods, etc
  - Data Policies for Data Release
- Data storage
- Automated data understanding
- Collaboration across multi-agencies
- Data Analysis and Correlation

Example: Difficulty Sharing Space Science Data

- Space scientists cannot easily locate or use data across the hundreds if not thousands of autonomous, heterogeneous, and distributed data systems currently in the Space Science community.
- Heterogeneous Systems
  - Data Management - RDBMS, ODBMS, HomeGrownDBMS, BinaryFiles
  - Platforms - UNIX, LINUX, WIN3.x/9x/NT, Mac, VMS, …
  - Interfaces - Web, Windows, Command Line
  - Data Formats - HDF, CDF, NetCDF, PDS, FITS, VICR, ASCII, ...
  - Data Volume - KiloBytes to TeraBytes
- Heterogeneous Disciplines
  - Moving targets and stationary targets
  - Multiple coordinate systems
  - Multiple data object types (images, cubes, time series, spectrum, tables, binary, document)
  - Multiple interpretations of single object types
  - Multiple software solutions to same problem
  - Incompatible and/or missing metadata

Evolution of Data Systems
(Trying to make order out of entropy)

Locally Centralized Data

Interoperable & Distributed Databases

Data System Evolution

<u>Local Database</u>
- Local Tools
- No Data Sharing between Centers
- No Common Data Elements

<u>Limited Data Sharing</u>
- Manual Data Sharing
- Manual Correlation
- Export/Import Data
- Limited CDEs

<u>Full Data Sharing</u>
- Location Independence
- Data Interchange
- Data Sharing
- Common CDEs between centers
- Heterogeneous Systems

Single Mission

NASA Data Architecture

Multi-Center, Multi Mission Environments

Object Oriented Data Technology

- Started in 1998 as a research and development task funded at JPL by the Office of Space Science to address
  - Application of Information Technology to Space Science
  - Provide an infrastructure for distributed data management
  - Research methods for interoperability, knowledge management and knowledge discovery
  - Develop software frameworks for data management to reuse software, manage risk, reduce cost and leverage IT experience
- OODT Initial focus
  - Data archiving – Manage heterogeneous data products and resources in a distributed, metadata-driven environment
  - Data location – Locate data products across multiple archives, catalogs and data systems
  - Data retrieval – Retrieve diverse data products from distributed data sources and integrate

JPL/NIH Interagency Agreements

- September 2000, JPL/NIH signed an interagency agreement to explore infusion of space science data architectures and technologies into NIH research networks
  - Agreement between JPL and Office of Science Policy, Office of the Director
- April 2002, JPL/NCI signed an interagency agreement
  - Agreement to transfer technology and build a knowledge environment for data sharing across the Early Detection Research Network

OODT Projects

- ***Technology Infrastructure for the Planetary Data System***
- Technology Infrastructure for the SeaWinds Earth Science Data System
- Basis for JPL Institutional Information Architecture
- Candidate framework driving standards for the International Consultative Committee of Space Science Data Systems (CCSDS)
- ***Technology Infrastructure for the NCI Early Detection Research Network (EDRN)***
- Technology Infrastructure for the Alaska State Government Denali Commission
- Future infrastructure for the Cassini Mission to Saturn
- Candidate Technology Infrastructure for a proposed Space Physics Archive System (SPASE)
- Proposed Technology Infrastructure for NASA Earth Science Data Systems

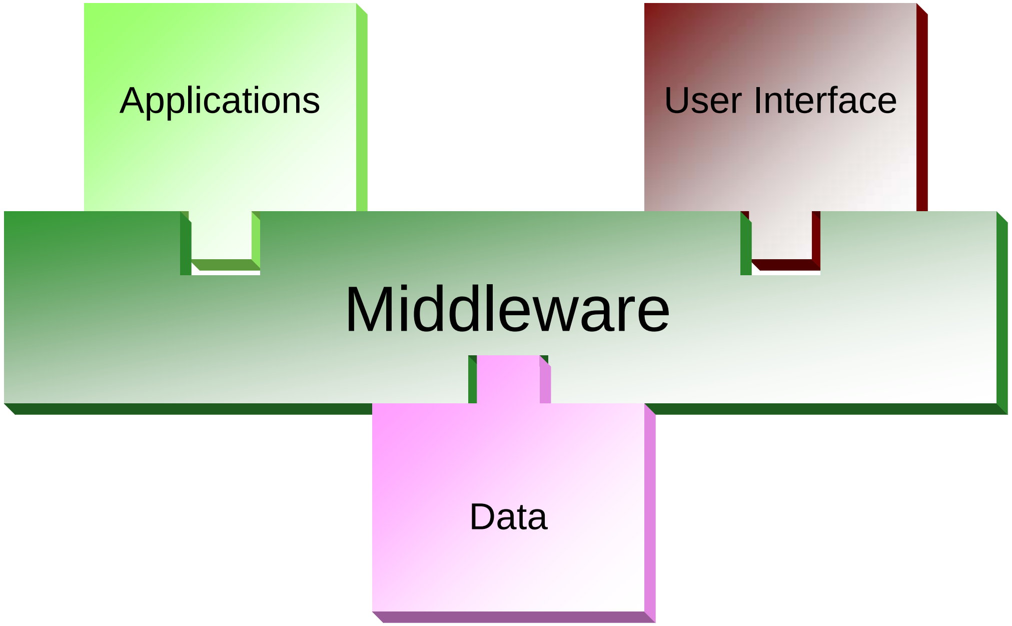
OODT System Design Goals

- **Separate the technology and the data architecture**
- Encapsulate individual data systems to hide uniqueness
- Provide data system location independence
- Require that communication between distributed systems use metadata
- Define a standard data dictionary structure and approach for describing systems and resources
- Provide a scalable and extensible solution
- Provide a mechanism for data product exchange
- Allow systems using different data dictionaries and metadata implementations to be integrated
- Define an architecture that can leverage off of open standard approaches

Technology Architecture

- Create intelligent middleware to capture and share data
- Implemented in Java
- Data layer implemented with the Extensible Markup Language (XML)
- Uses Java Remote Method Invocation (RMI)
- Secure Socket Layer (SSL) for data encryption
- Uses a standardized XML DTD messaging and querying language for communication
- Support a variety of client access methods
  - Java API
  - HTTP

Middleware Data Encapsulation



Middleware can tie application, data, and user interfaces together and hide the unique interfaces

Data Architecture

- Use Extensible Markup Language (XML) for the data architecture
  - Use XML metadata tags to describe data products
    - Metadata provides labels for describing data products
    - Metadata provides location information about products which can be stored remotely
  - Use XML for messaging between distributed computers
    - Standard for the exchange of information
    - A query language for locating and retrieving disparate data products

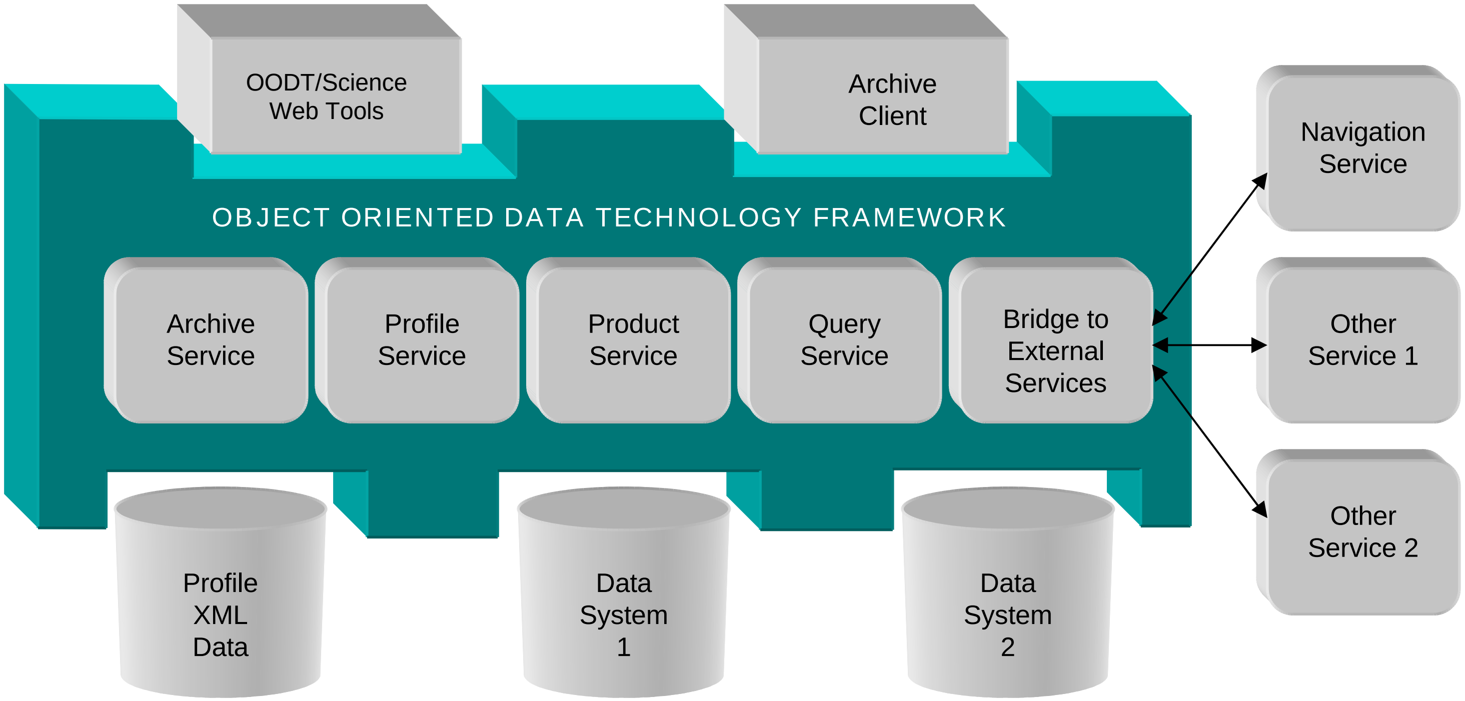
Metadata Development

- Metadata has been identified as a critical component of capturing and sharing data
  - http://www.cio.gov/docs/metadata.htm
- Develop methods for managing the semantics of data that are shared within and between domains
  - Data Dictionary – Inventory of domain terms with definitions and other distinguishing attributes.
    - Common set of data elements used to describe information
  - XML for metadata registry and communication
- Use standards where appropriate
  - ISO/IEC 11179 – A framework for the Specification and Standardization of Data Elements
  - Dublin Core – A metadata element set intended to facilitate discovery of electronic resources.

OODT Component Framework

- Java based software middleware component architecture that provides a software framework for archiving, search and retrieval, and data product exchange
  - Archive Component – Archive Service
    - Provides centralized data archiving and cataloging of data products
    - Distributed
  - Profile Metadata Component – Profile Service
    - Manage metadata associated with resources (i.e. pointers to data products)
    - Locate resources across geographically distributed data systems
    - Distributed
  - Data Product Exchange Component – Product Service
    - Support interchange (data sharing) of data products
    - Support heterogeneous implementations and systems
    - Distributed
  - Query Service Component – Query Service
    - Ties search and product exchange services together
    - Distributed

Component Framework for OODT



Solutions to Data Search

- Build metadata “profiles” that describe data system resources
  - Define using “XML”
  - Encapsulate individual data systems resources (Hide uniqueness)
  - Enable interoperability based on metadata compatibility
  - Refocus problem on metadata development
    - Communicate using metadata (Provide metadata with data)
  - Provide a core framework of software components to interconnect distributed data systems
- Define profiles using standard industry approaches
  - Use XML to describe profiles
  - ISO/IEC 11179 – A framework for the Specification and Standardization of Data Elements
  - Dublin Core – A metadata element set intended to facilitate discovery of electronic resources.

Profile DTD

```
<!ELEMENT profiles
  (profile+)>

<!ELEMENT profile
  (profAttributes,
   resAttributes,
   profElement*)>

    <!ELEMENT profAttributes
      (profId, profVersion*, profTitle*, profDesc*, profType*,
       profStatusId*, profSecurityType*, profParentId*, profChildId*,
       profRegAuthority*, profRevisionNote*, profDataDictId*)>

    <!ELEMENT resAttributes
      (Identifier, Title*, Format*, Description*, Creator*, Subject*,
       Publisher*, Contributor*, Date*, Type*, Source*,
       Language*, Relation*, Coverage*, Rights*,
       resContext*, resAggregation*, resClass*, resLocation*)>

    <!ELEMENT profElement
      (elemId*, elemName, elemDesc*, elemType*, elemUnit*,
       elemEnumFlag*, (elemValue | (elemMinValue, elemMaxValue))*,
       elemSynonym*,
       elemObligation*, elemMaxOccurrence*, elemComment*)>
```

XML Profile Example (1 of 2)

Headers and Dublin Core

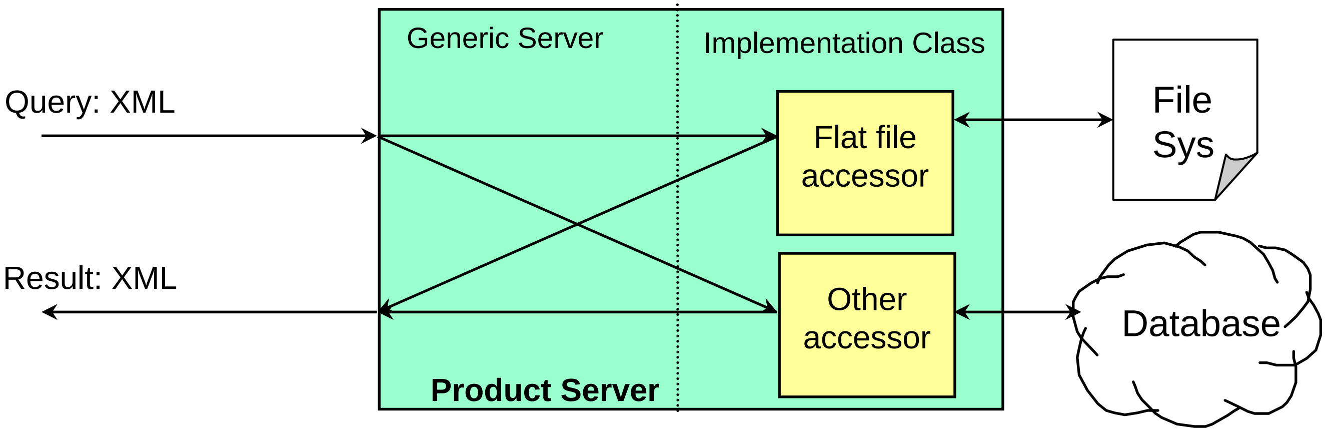
```
<profile>
 <profAttributes>
  <profId>OODT_PDS_DATA_SET_INV_82</profId>
<profDataDictId>OODT_PDS_DATA_SET_DD_V1.0</profDataDictId>
 </profAttributes>
 <resAttributes>
  <Identifier>VO1/VO2-M-VIS-5-DIM-V1.0</Identifier>
  <Title>VO1/VO2 MARS VISUAL IMAGING SUBSYSTEM DIGITAL …</Title>
  <Format>text/html</Format>
  <Language>en</Language>
  <resContext>PDS</resContext>
  <resAggregation>dataSet</resAggregation>
  <resClass>data.dataSet</resClass>
 <resLocation>http://pds.jpl.nasa.gov/cgi-bin/pdsserv.pl?…</resLocation>
 </resAttributes>
```

XML Profile Example (2 of 2)
Domain Data Elements

```
<profElement>
   <elemId>ARCHIVE_STATUS</elemId>
   <elemName>ARCHIVE_STATUS</elemName>
   <elemType>ENUMERATION</elemType>
   <elemEnumFlag>T</elemEnumFlag>
   <elemValue>ARCHIVED</elemValue>
  </profElement>
  <profElement>
   <elemId>TARGET_NAME</elemId>
   <elemName>TARGET_NAME</elemName>
   <elemType>ENUMERATION</elemType>
   <elemEnumFlag>T</elemEnumFlag>
   <elemValue>MARS</elemValue>
  </profElement>
</profile>
```

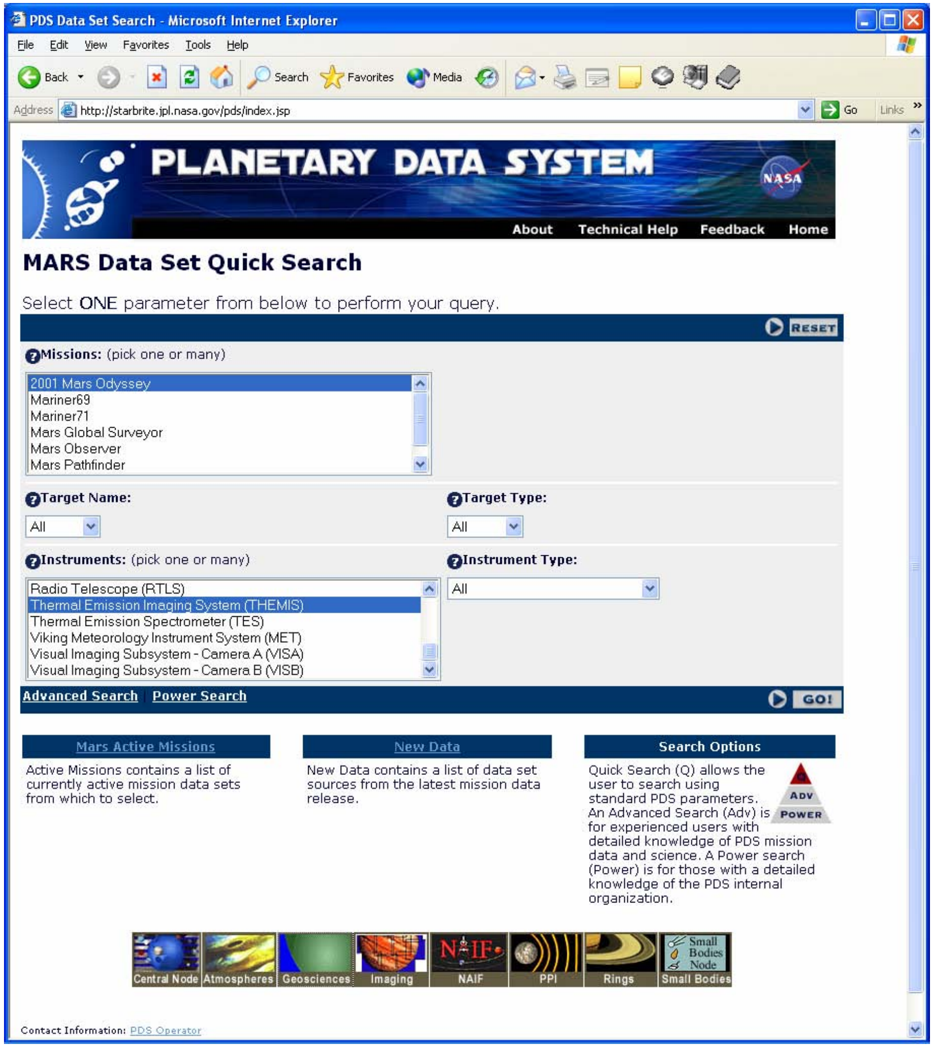
Solutions to Data Product Exchange

- Extend framework to support common access to distributed data systems by creating a “Product Service Component”
  - Product Servers - Middleware that negotiates the interfaces between the data system implementations despite the heterogeneity
- Design the component to leverage off of consistent data architecture
- Provide data and location abstraction
- Provide a standard language for communication



Planetary Data System (PDS)

- Official NASA “Active” Archive for all Planetary Data
  - Data ingestion required as part of Announcement of Opportunity (AO) for a mission
- 9 Nodes with data located at discipline sites
- Common Data Architecture
- Different data systems located at the sites
- Prior to October 2002, no ability to find and share data between PDS nodes
  - Data distribution via CD ROM
  - Limited electronic distribution



http://starbrite.jpl.nasa.gov/pds/index.jsp

MARS Data Set Quick Search

Select ONE parameter from below to perform your query.

Missions: (pick one or many)

2001 Mars Odyssey
Mariner69
Mariner71
Mars Global Surveyor
Mars Observer
Mars Pathfinder

Target Name: All

Target Type: All

Instruments: (pick one or many)

Radio Telescope (RTLS)
Thermal Emission Imaging System (THEMIS)
Thermal Emission Spectrometer (TES)
Viking Meteorology Instrument System (MET)
Visual Imaging Subsystem - Camera A (VISA)
Visual Imaging Subsystem - Camera B (VISB)

Instrument Type: All

Advanced Search Power Search

Mars Active Missions

Active Missions contains a list of currently active mission data sets from which to select.

New Data

New Data contains a list of data set sources from the latest mission data release.

Search Options

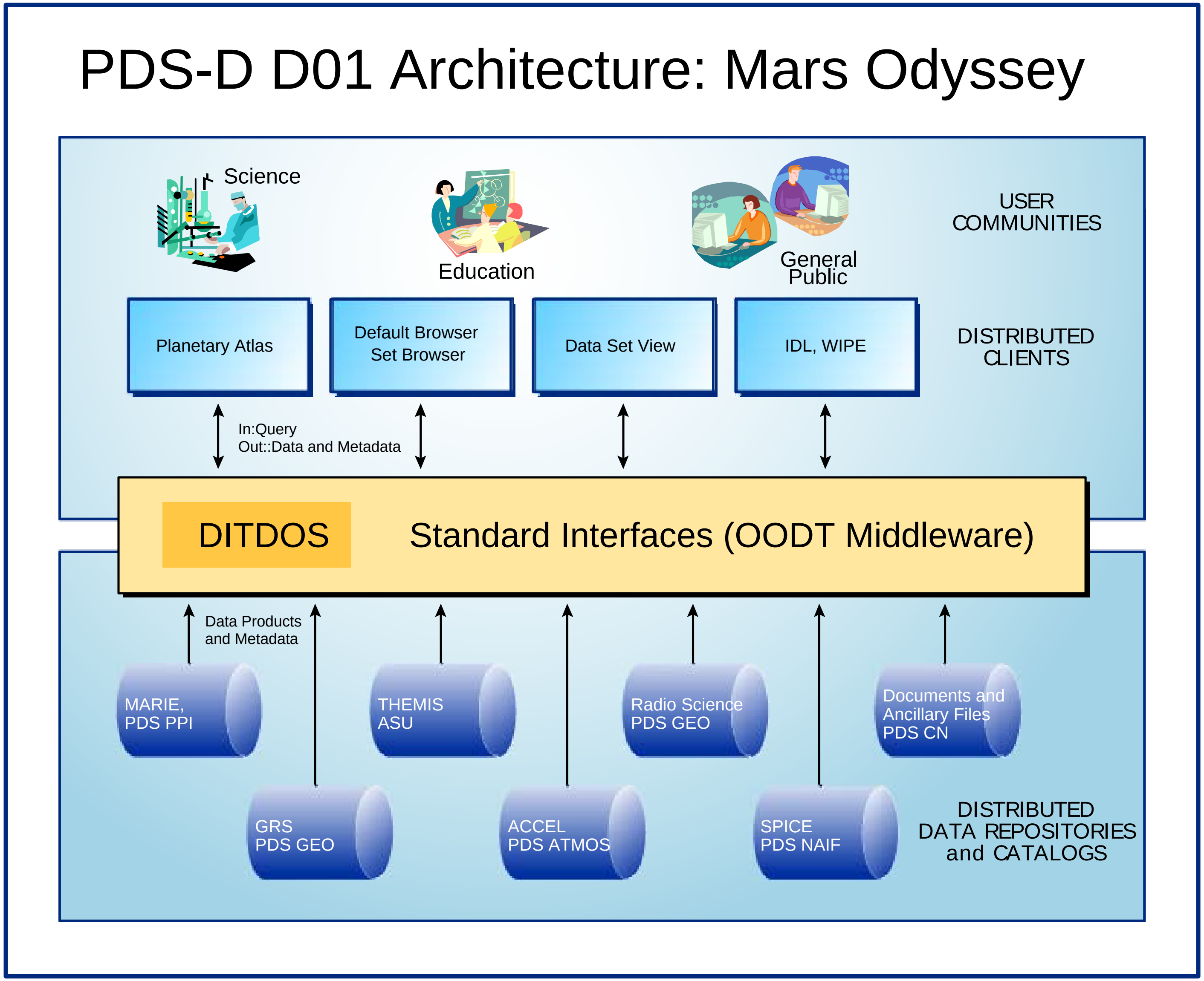
Quick Search (Q) allows the user to search using standard PDS parameters. An Advanced Search (Adv) is for experienced users with detailed knowledge of PDS mission data and science. A Power search (Power) is for those with a detailed knowledge of the PDS internal organization.

Contact Information: PDS Operator

PDS for Mars Odyssey

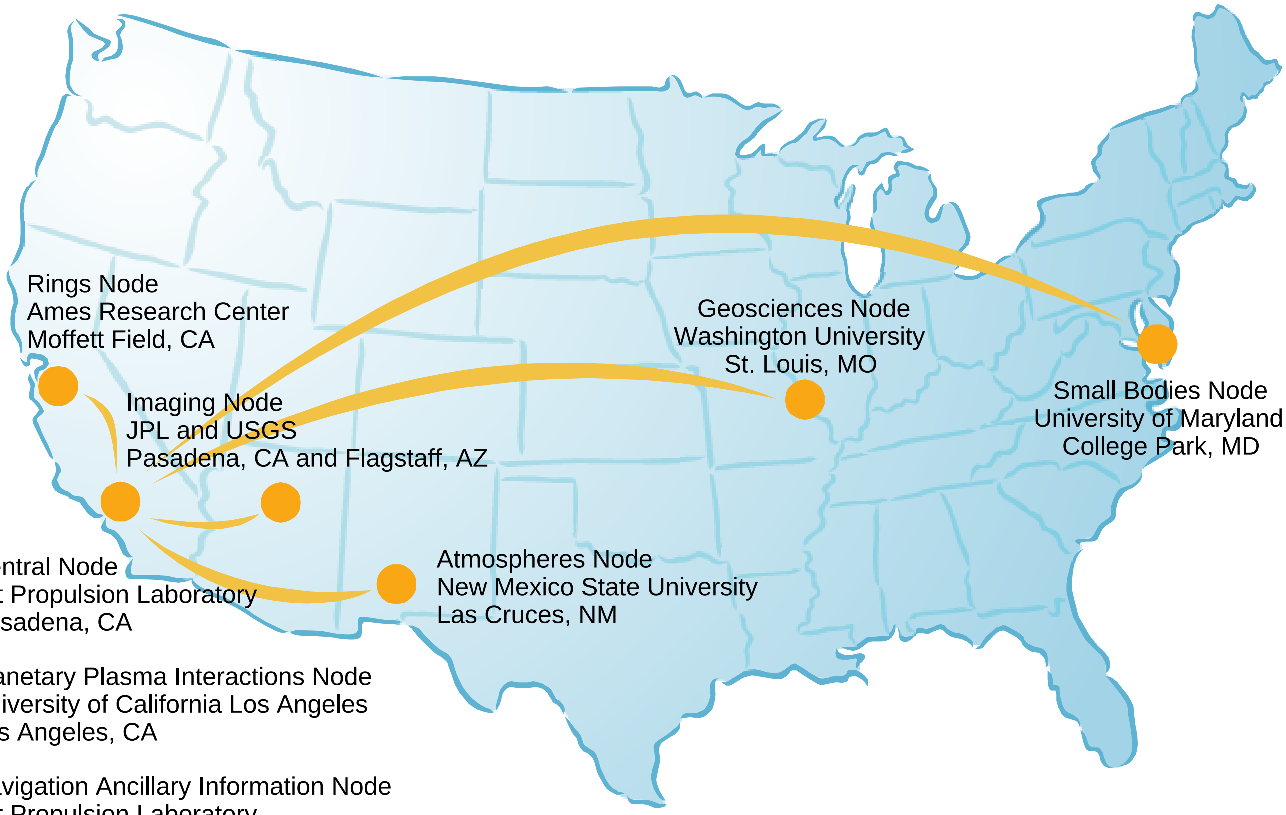
- Provide unified view across distributed science data archives
- Support online distribution of science data to scientists (up to 250 MB products)
  - Enable interoperability to distributed PDS data nodes
  - Internet as the primary means of distribution of data products
  - A unified web interface for accessing all PDS data products
  - Support real-time access to data products
- Provide a common messaging technology architecture allowing scientists and developers to link in their own tools
- Uses existing PDS databases and repositories

Deployed PDS System



PDS Nodes

Planetary Data System
Distributed Planetary Science Archive



Rings Node
Ames Research Center
Moffett Field, CA

Imaging Node
JPL and USGS
Pasadena, CA and Flagstaff, AZ

Geosciences Node
Washington University
St. Louis, MO

Small Bodies Node
University of Maryland
College Park, MD

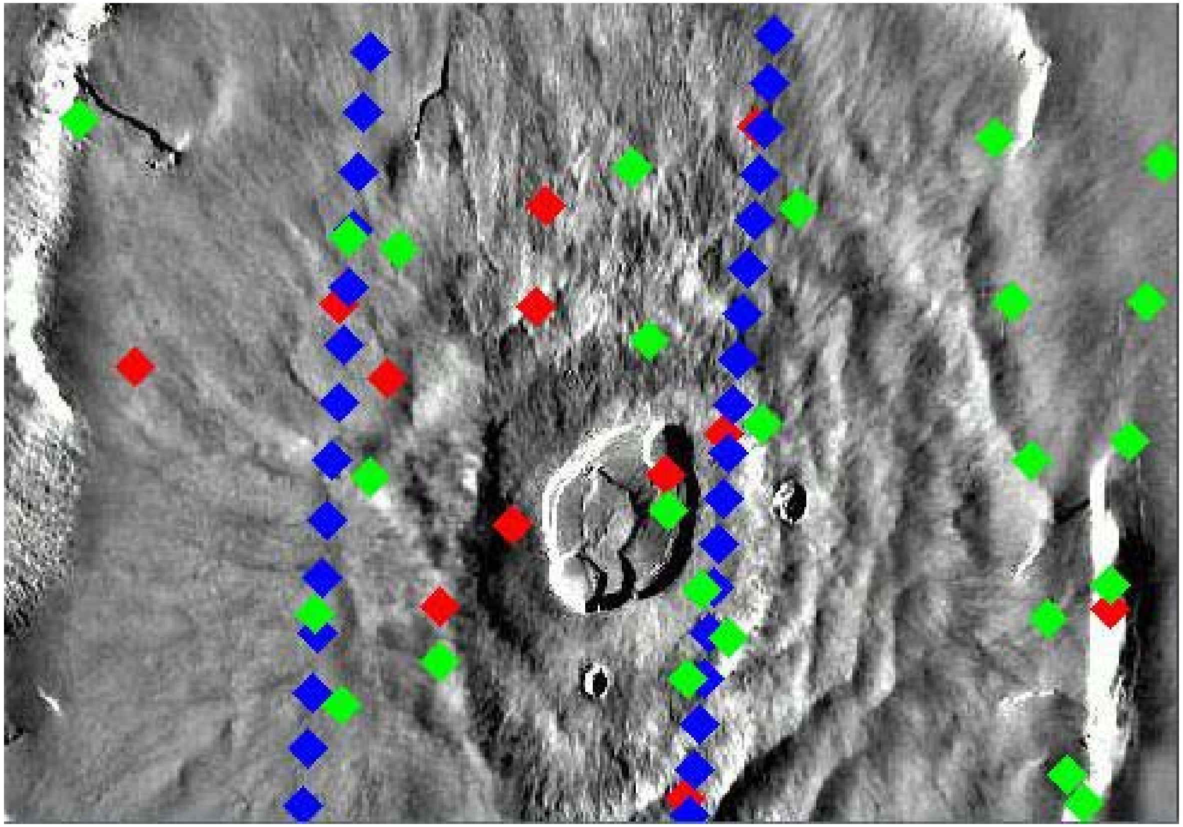
Atmospheres Node
New Mexico State University
Las Cruces, NM

Central Node
Jet Propulsion Laboratory
Pasadena, CA

Planetary Plasma Interactions Node
University of California Los Angeles
Los Angeles, CA

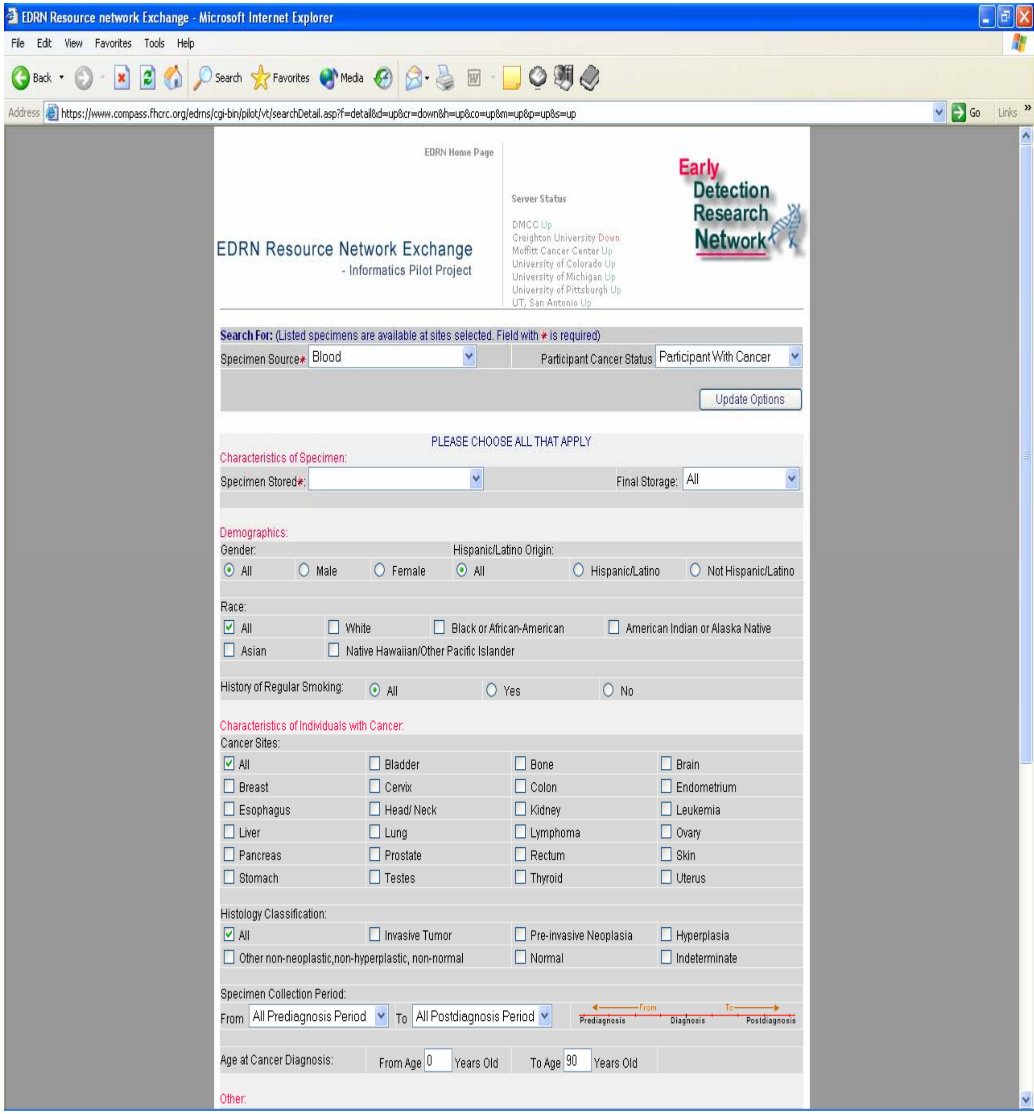
Navigation Ancillary Information Node
Jet Propulsion Laboratory
Pasadena, CA

Data set Correlation for Planetary Science



NCI Early Detection Research Network - EDRN

- Funded by the National Cancer Institute
- Network consists of 18 Labs
  - DMCC (Fred Hutchinson)
  - Clinical Epidemiological Centers
  - Biomarker Development Labs
  - Biomarker Validation Labs
- Specimen data located at labs
- Data in validation studies
  - Captured and archived centrally


EDRN Resource network Exchange - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back
Search
Favorites
Media
Address
Go
Links
EDRN Home Page
Update Options

https://www.compass.fhcrc.org/edrns/cgi-bin/pilot/vt/searchDetail.asp?f=detail&d=up&cr=down&h=up&co=up&m=up&p=up&s=up

EDRN Resource Network Exchange
- Informatics Pilot Project

Server Status

DMCC Up
Creighton University Down
Moffitt Cancer Center Up
University of Colorado Up
University of Michigan Up
University of Pittsburgh Up
UT, San Antonio Up

Early Detection Research Network

Search For: (Listed specimens are available at sites selected. Field with * is required)

Specimen Source*: Blood

Participant Cancer Status: Participant With Cancer

PLEASE CHOOSE ALL THAT APPLY

Characteristics of Specimen:

Specimen Stored*:

Final Storage: All

Demographics:

Gender: ● All ○ Male ○ Female

Hispanic/Latino Origin: ● All ○ Hispanic/Latino ○ Not Hispanic/Latino

Race:

☑ All	□ White	□ Black or African-American	□ American Indian or Alaska Native
□ Asian	□ Native Hawaiian/Other Pacific Islander		

History of Regular Smoking: ● All ○ Yes ○ No

Characteristics of Individuals with Cancer:

Cancer Sites:

☑ All	□ Bladder	□ Bone	□ Brain
□ Breast	□ Cervix	□ Colon	□ Endometrium
□ Esophagus	□ Head/ Neck	□ Kidney	□ Leukemia
□ Liver	□ Lung	□ Lymphoma	□ Ovary
□ Pancreas	□ Prostate	□ Rectum	□ Skin
□ Stomach	□ Testes	□ Thyroid	□ Uterus

Histology Classification:

☑ All	□ Invasive Tumor	□ Pre-invasive Neoplasia	□ Hyperplasia
□ Other non-neoplastic,non-hyperplastic, non-normal		□ Normal	□ Indeterminate

Specimen Collection Period:

From All Prediagnosis Period To All Postdiagnosis Period

Age at Cancer Diagnosis: From Age 0 Years Old To Age 90 Years Old

Other:

EDRN Informatics Goals

- Develop a collaborative *knowledge* environment that
  - Provides *seamless access* to science data resources captured in EDRN studies
  - Allows investigators to *share* data using informatics tools
  - *Increases* the sample size of data resources by combining and correlating data from multiple EDRN sites
  - Provides data *standards* in the capture and exchange of critical data sets
  - *Use* existing IT infrastructures and tools located at EDRN PI sites
  - *Minimize* impact on IT systems already in place
  - Allows the IT environment to *evolve* as new data sets are available

EDRN Informatics Key Challenges

- Data are *geographically distributed across heterogeneous* data systems making the location, retrieval and use of this data difficult
  - Data at each site is captured *differently* in
    - database systems
    - data formats
    - data definitions
  - Access to data at each site is *limited* to local tools and users
- *Different* levels of IT support and capabilities at each institution
- Data *sharing* and *privacy* issues

EDRN Informatics Approach

- Develop a *cross-disciplinary* team of biomedical and computer science researchers
- Develop *Common Data Elements* to standardize data definitions for databases, forms, and communication
- Develop an *Informatics infrastructure* that allows for data located in disparate databases to exchange information
  - Leverage JPL/NASA's *experience* and software in developing IT infrastructures to support planetary science
  - Use *existing EDRN databases* without requiring changes (i.e. software handles translation between local database and EDRN)
  - Deploy common software at EDRN sites
  - Develop a *common IRB protocol*
- Develop a common science *portal* to provide a single point of entry to EDRN data resources

Benefits of Informatics Infrastructure

- *Seamless* search and retrieval of data products
  - Users can access EDRN resources without knowing their location (“*one stop shopping*”)
  - *Integration* of EDRN Sites (one integrated system!)
  - Support *heterogeneous* data repositories
  - Support *geographically distributed* data repositories
- *Standard interfaces* for software developers to develop new bioinformatics tools
- Provide a *translation layer* between EDRN and the local institution’s database
- *Plug-ins* for preferred tools (i.e. SAS)
- EDRN can *evolve* as basic information technology changes

EDRN Informatics Tools

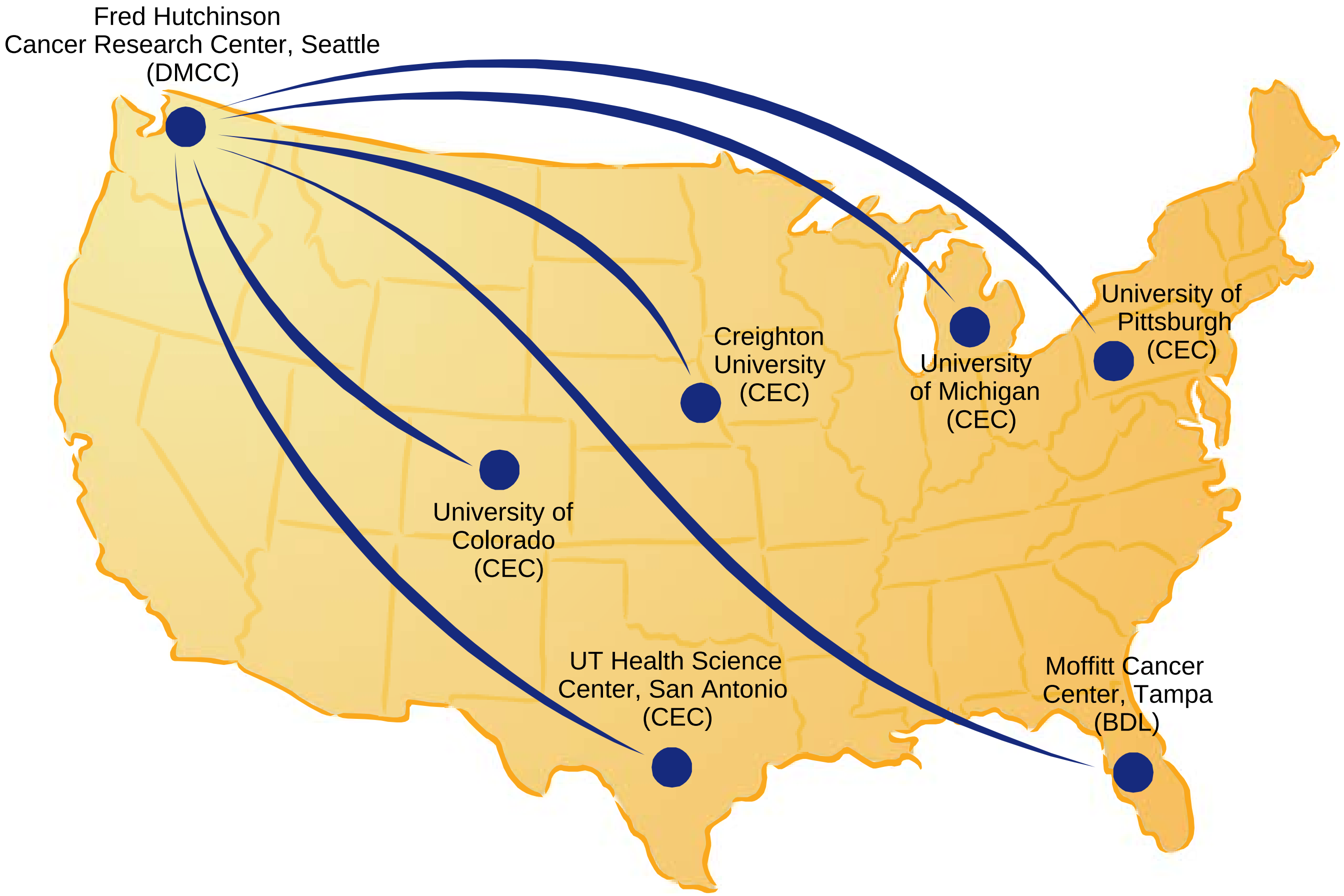
- EDRN Secure Website
  - A *unified portal* allowing PIs to access shared information
  - Restricted to EDRN *registered* users
  - Uses the Internet as the primary means of access to the data
  - A *collaborative website* for sharing of information among PIs

- EDRN Resource Network Exchange (ERNE)
  - An *infrastructure* for sharing data resources across EDRN
  - Supports *real time* (on demand) *distribution* of data to users
  - First release - *Specimen sharing tool*

- EDRN CDE Mapping Tool
  - Allow EDRN sites to *map local data definitions* to Common Data Elements (CDEs)

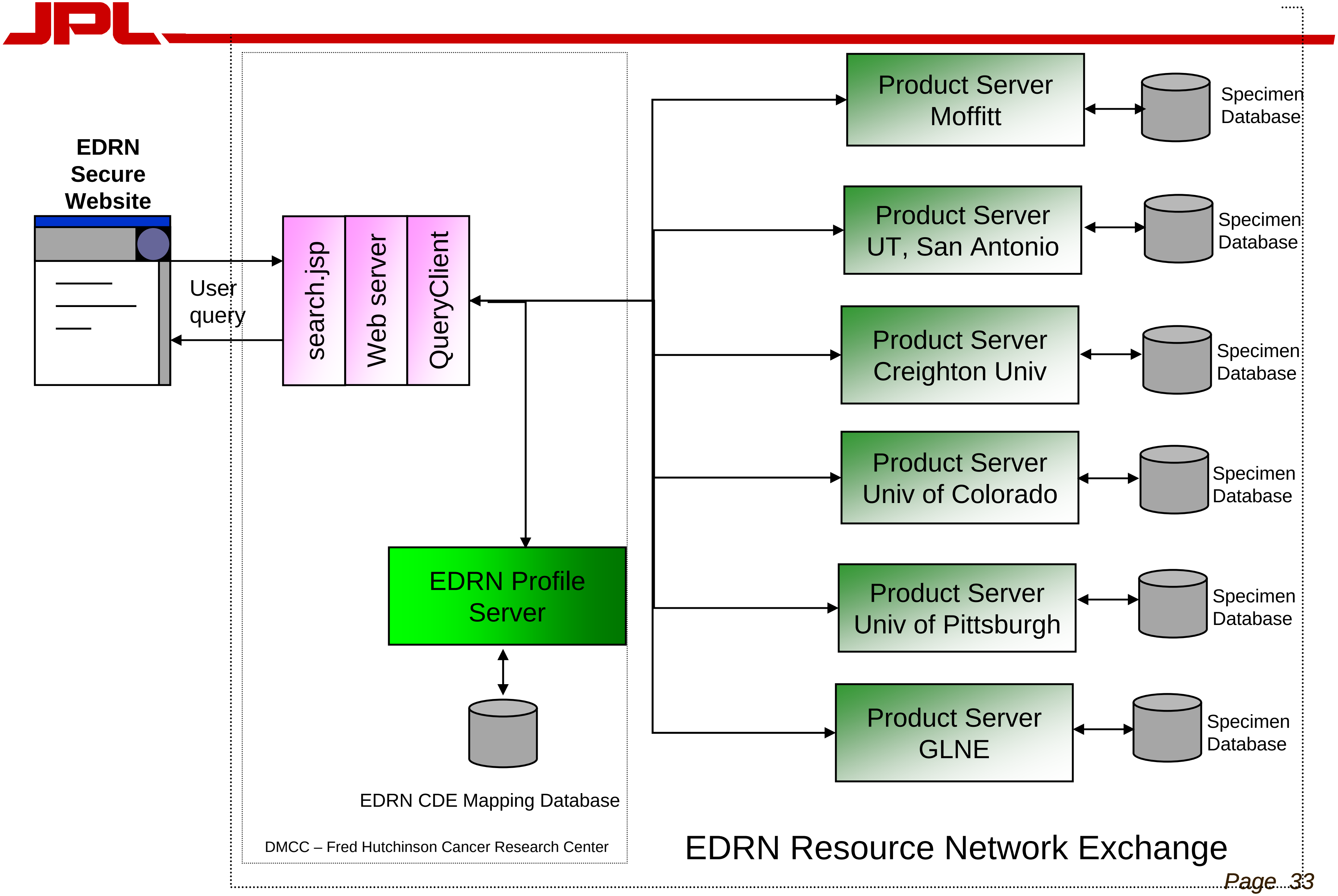
EDRN Resource Network Exchange Tool

National Data Sharing Infrastructure
Supporting Collaboration In Biomedical Research For EDRN


Fred Hutchinson Cancer Research Center, Seattle (DMCC)
Creighton University (CEC)
University of Michigan (CEC)
University of Pittsburgh (CEC)
University of Colorado (CEC)
UT Health Science Center, San Antonio (CEC)
Moffitt Cancer Center, Tampa (BDL)

As of September 2002

Rollout of EDRN Informatics Infrastructure



EDRN Query Scenario

- Find *DNA blood specimens* for participants younger than 70 years old that have cancer

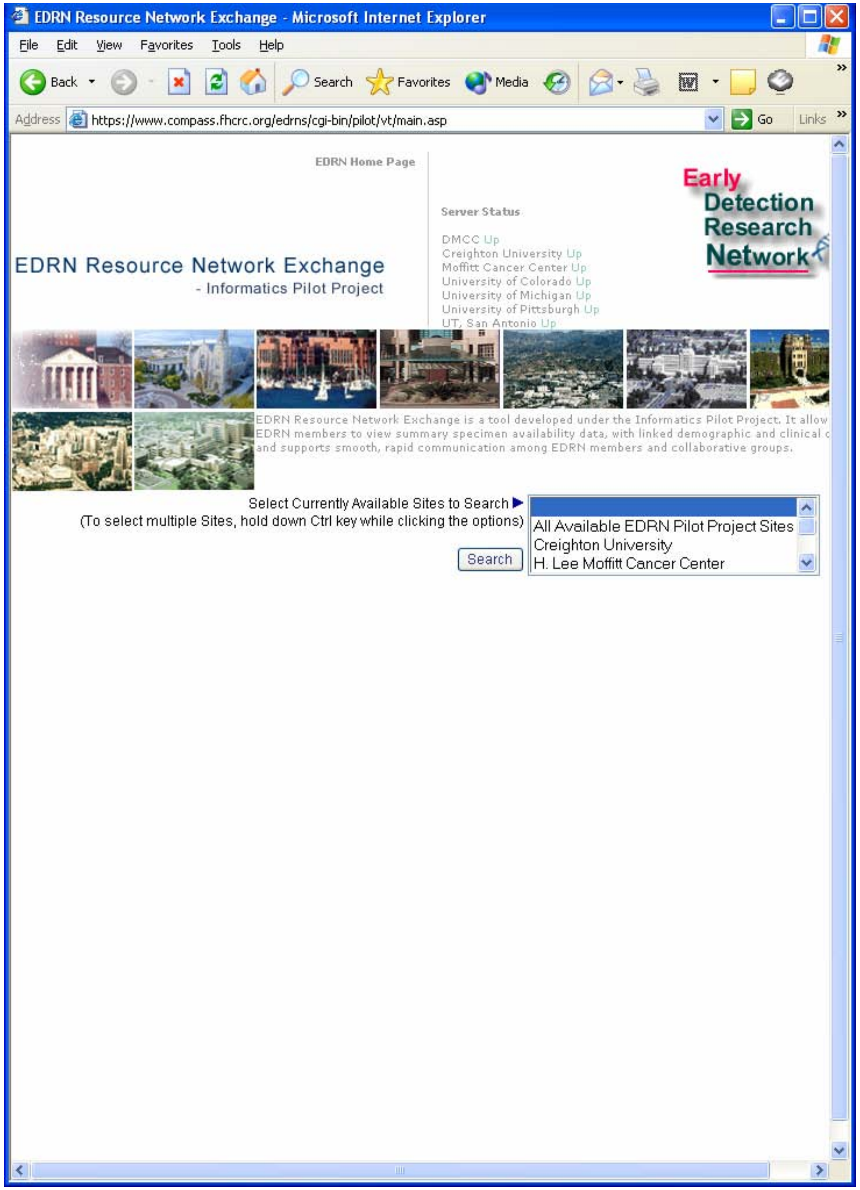
- Possible constraints
  - Cancer Site
  - Storage Mechanism
  - Smoking
  - Age
  - Ethnicity

ERNE Search Tool

- Connects to distributed databases

- Reports all available sites

- Allows user to select specific or all sites



EDRN Resource Network Exchange - Microsoft Internet Explorer

https://www.compass.fhcrc.org/edrns/cgi-bin/pilot/vt/main.asp

EDRN Home Page

EDRN Resource Network Exchange
- Informatics Pilot Project

Server Status

DMCC Up
Creighton University Up
Moffitt Cancer Center Up
University of Colorado Up
University of Michigan Up
University of Pittsburgh Up
UT, San Antonio Up

Early Detection Research Network

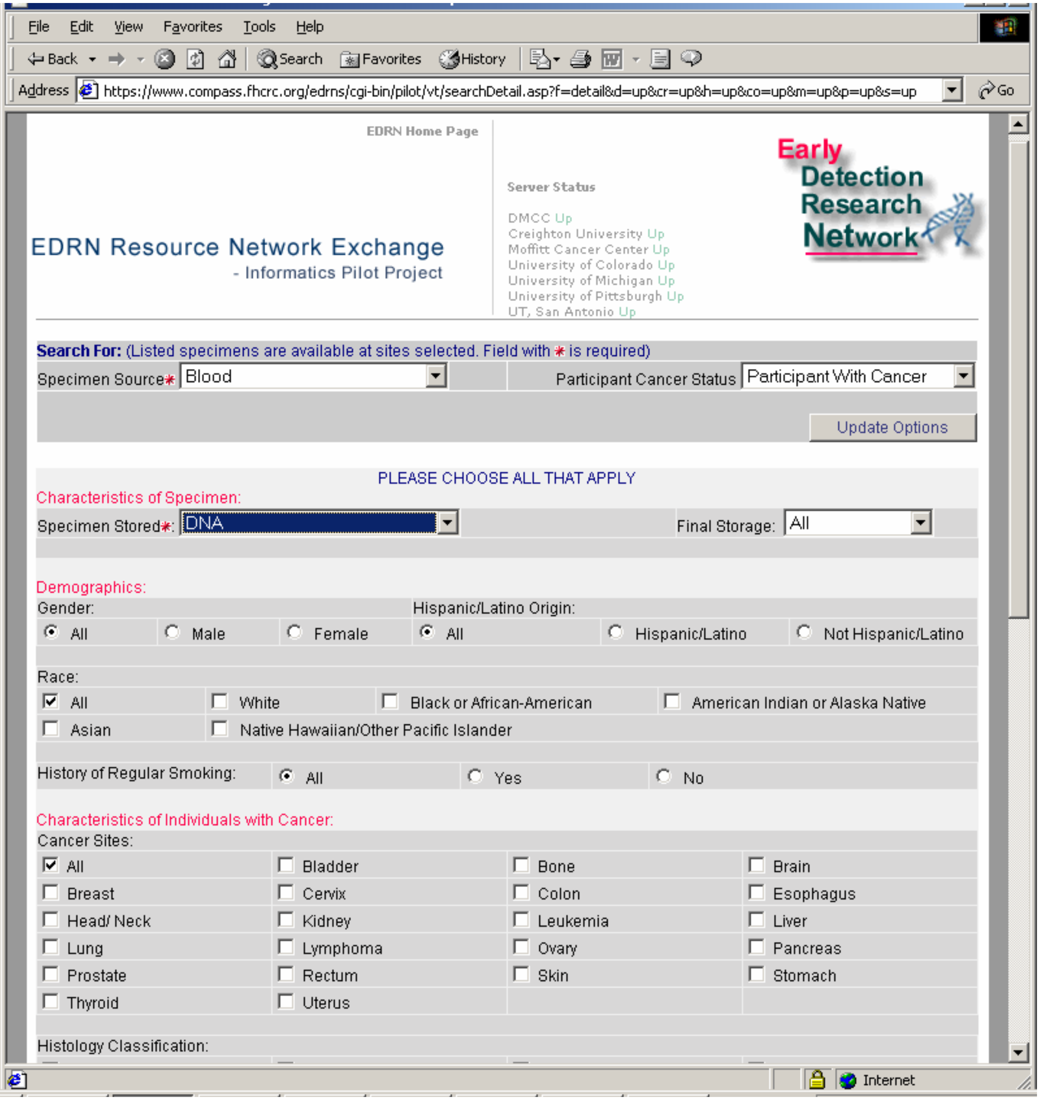
EDRN Resource Network Exchange is a tool developed under the Informatics Pilot Project. It allow
EDRN members to view summary specimen availability data, with linked demographic and clinical c
and supports smooth, rapid communication among EDRN members and collaborative groups.

Select Currently Available Sites to Search ▶
(To select multiple Sites, hold down Ctrl key while clicking the options)

All Available EDRN Pilot Project Sites
Creighton University
H. Lee Moffitt Cancer Center

EDRN Query Example

- Bio-specimen search
- Based on CDEs
- Real time access to EDRN data
- Search performed locally at each institution



https://www.compass.fhcrc.org/edrns/cgi-bin/pilot/vt/searchDetail.asp?f=detail&d=up&cr=up&h=up&co=up&m=up&p=up&s=up

EDRN Home Page

EDRN Resource Network Exchange
- Informatics Pilot Project

Server Status

DMCC Up
Creighton University Up
Moffitt Cancer Center Up
University of Colorado Up
University of Michigan Up
University of Pittsburgh Up
UT, San Antonio Up

Early Detection Research Network

Search For: (Listed specimens are available at sites selected. Field with * is required)

Specimen Source*: Blood   Participant Cancer Status: Participant With Cancer

PLEASE CHOOSE ALL THAT APPLY

Characteristics of Specimen:

Specimen Stored*: DNA   Final Storage: All

Demographics:

Gender: ● All ○ Male ○ Female

Hispanic/Latino Origin: ● All ○ Hispanic/Latino ○ Not Hispanic/Latino

Race:

☑ All	☐ White	☐ Black or African-American	☐ American Indian or Alaska Native
☐ Asian	☐ Native Hawaiian/Other Pacific Islander		

History of Regular Smoking: ● All ○ Yes ○ No

Characteristics of Individuals with Cancer:

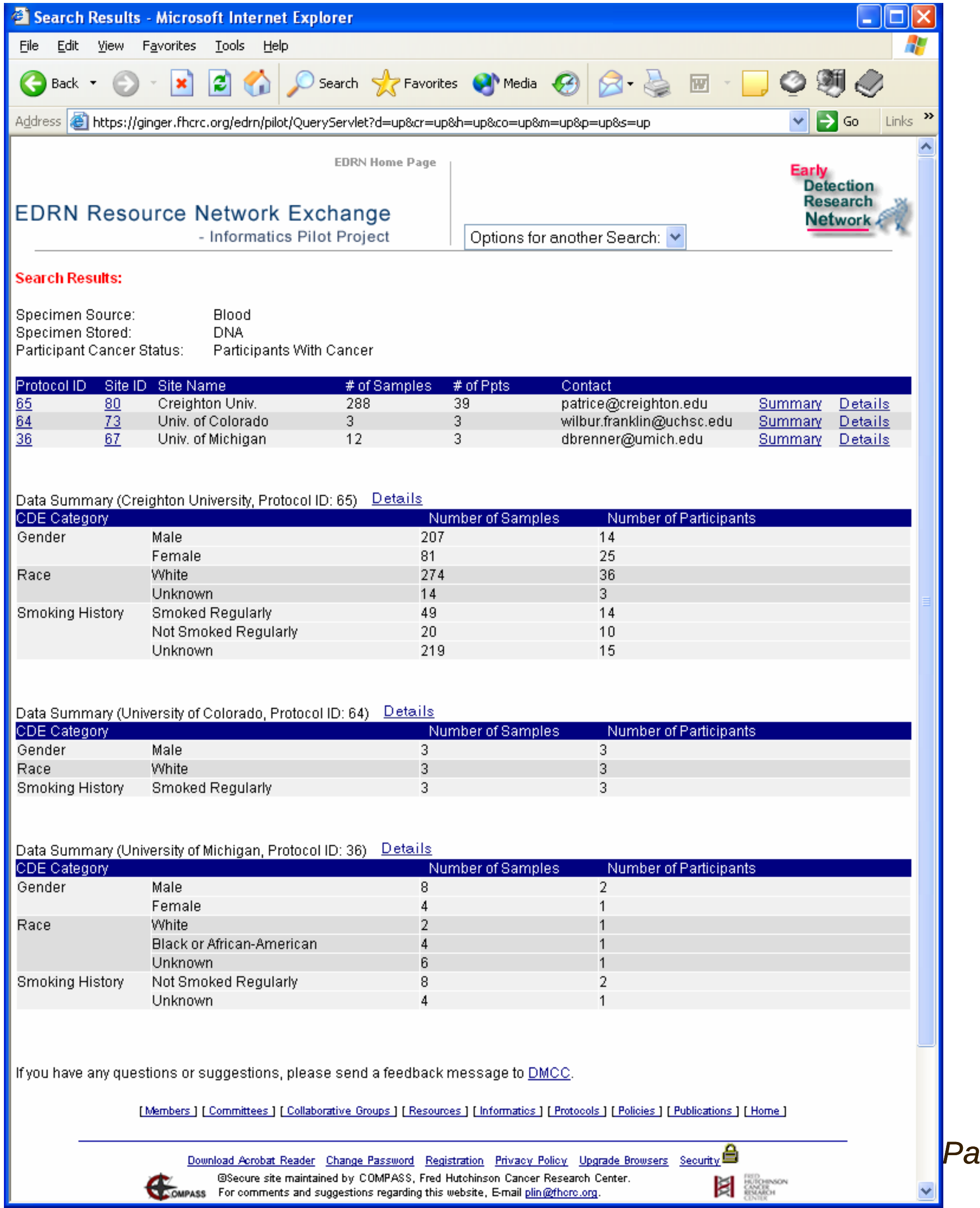
Cancer Sites:

☑ All	☐ Bladder	☐ Bone	☐ Brain
☐ Breast	☐ Cervix	☐ Colon	☐ Esophagus
☐ Head/ Neck	☐ Kidney	☐ Leukemia	☐ Liver
☐ Lung	☐ Lymphoma	☐ Ovary	☐ Pancreas
☐ Prostate	☐ Rectum	☐ Skin	☐ Stomach
☐ Thyroid	☐ Uterus		

Histology Classification:

EDRN Query Results

- Results from all applicable sites based on query
- Summary information of samples from each site
- Ability to drill down through results


Search Results - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back
Search
Favorites
Media
Address
https://ginger.fhcrc.org/edrn/pilot/QueryServlet?d=up&cr=up&h=up&co=up&m=up&p=up&s=up
Go
Links
EDRN Home Page
Early Detection Research Network
Options for another Search:

EDRN Resource Network Exchange
- Informatics Pilot Project

Search Results:

Specimen Source:	Blood
Specimen Stored:	DNA
Participant Cancer Status:	Participants With Cancer

Protocol ID	Site ID	Site Name	# of Samples	# of Ppts	Contact		
65	80	Creighton Univ.	288	39	patrice@creighton.edu	Summary	Details
64	73	Univ. of Colorado	3	3	wilbur.franklin@uchsc.edu	Summary	Details
36	67	Univ. of Michigan	12	3	dbrenner@umich.edu	Summary	Details

Data Summary (Creighton University, Protocol ID: 65) Details

CDE Category		Number of Samples	Number of Participants
Gender	Male	207	14
	Female	81	25
Race	White	274	36
	Unknown	14	3
Smoking History	Smoked Regularly	49	14
	Not Smoked Regularly	20	10
	Unknown	219	15

Data Summary (University of Colorado, Protocol ID: 64) Details

CDE Category		Number of Samples	Number of Participants
Gender	Male	3	3
Race	White	3	3
Smoking History	Smoked Regularly	3	3

Data Summary (University of Michigan, Protocol ID: 36) Details

CDE Category		Number of Samples	Number of Participants
Gender	Male	8	2
	Female	4	1
Race	White	2	1
	Black or African-American	4	1
	Unknown	6	1
Smoking History	Not Smoked Regularly	8	2
	Unknown	4	1

If you have any questions or suggestions, please send a feedback message to DMCC.

[Members] [Committees] [Collaborative Groups] [Resources] [Informatics] [Protocols] [Policies] [Publications] [Home]

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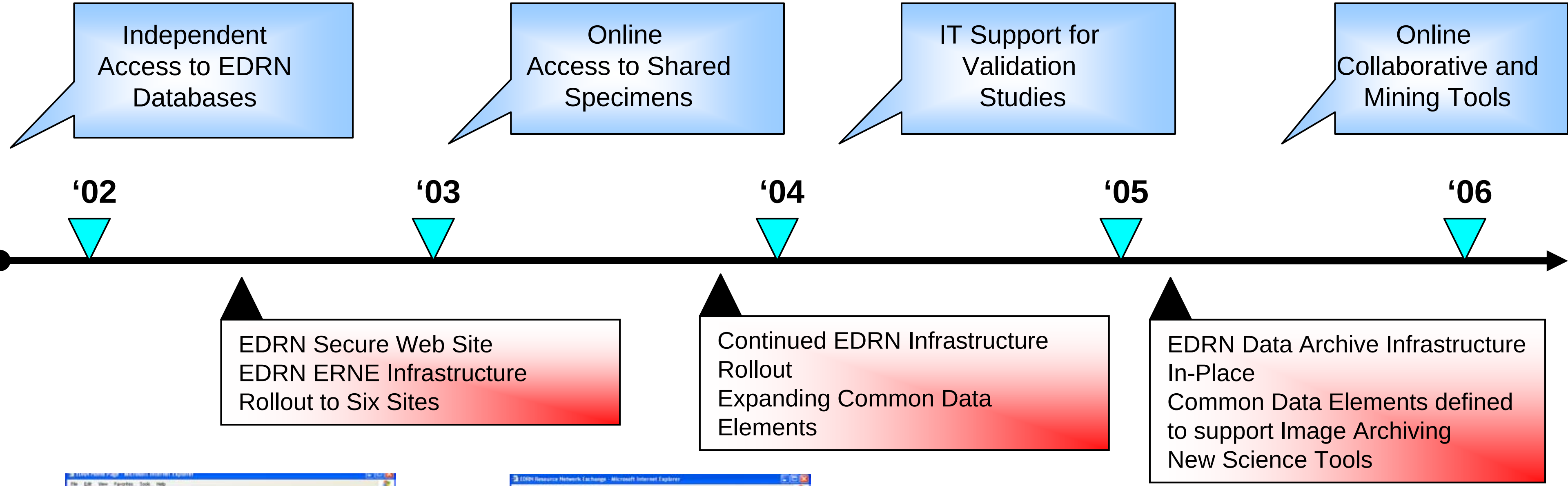
©Secure site maintained by COMPASS, Fred Hutchinson Cancer Research Center.
For comments and suggestions regarding this website, E-mail plin@fhcrc.org.

Available Specimens

Site	Specimen	Cancer Type
Moffitt	Blood, Bone marrow, Sputum, Tissue	Various/Lung
San Antonio	Blood	Prostate/various
Creighton	Blood, Tissue	Various
GLNE	Blood, Tissue, Urine	Colon/various
Colorado	Blood, Sputum, Tissue, Urine	Various
Pittsburgh	Blood	Various

EDRN Informatics Timeline



Independent Access to EDRN Databases

Online Access to Shared Specimens

IT Support for Validation Studies

Online Collaborative and Mining Tools

EDRN Secure Web Site
EDRN ERNE Infrastructure Rollout to Six Sites

Continued EDRN Infrastructure Rollout
Expanding Common Data Elements

EDRN Data Archive Infrastructure In-Place
Common Data Elements defined to support Image Archiving
New Science Tools

Early Detection Research Network

An infrastructure for supporting collaborative research on molecular, genetic and other biomarkers in early cancer detection and risk assessment

NATIONAL CANCER INSTITUTE
DIVISION OF CANCER PREVENTION

Meetings

- The Sixth EDRN Steering Committee Meetings
- EC Meeting Conference Call on April 24 and May 29
- Informatics Project W.G. Conference Call, July 3, 2002

Documents

- Request for Application for Supplement Funds
- Manual of Operations
- Common Data Element (CDE) Documents
- Application Requirements for Release of Restricted Funds
- Application Requirements for Release of Core Funds

Frequently Used

- Site Task Reminder
- Find Research Partners | Post Research Interests
- Find Investigators & Staff | Update Contact Information
- Obtain Protocol ID | Find Registered Protocols
- Find Specimen within EDRN | Submit Specimen Survey

Announcements

To read the spring/summer issue of the High Risk Registry Newsletter, click here.

Sites Announcements

About the EDRN Secure Web Site

Welcome to the secure web site for the Early Detection Research Network (EDRN). This site is designed to facilitate communication and collaboration among EDRN scientists and staff more information...

About the EDRN

The Division of Cancer Prevention in the National Cancer Institute created the Early Detection Research Network (EDRN) for supporting investigator-initiated, collaborative research on molecular, genetic and other biomarkers for human cancer detection and risk assessment. more information...

[illegible]

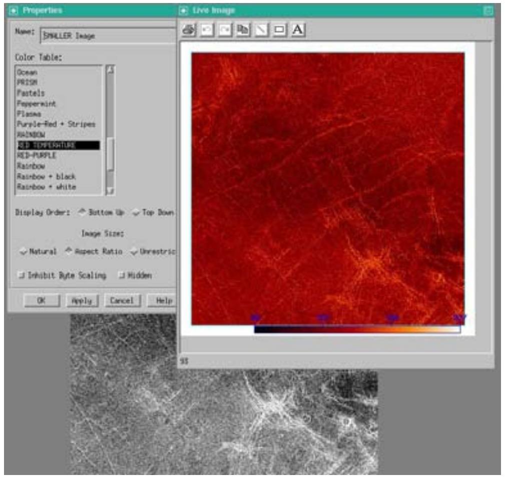
EDRN Resource Network Exchange - Microsoft Internet Explorer

EDRN Resource Network Exchange
- Informatics Pilot Project

Early Detection Research Network

Select Currently Available Sites to Search
(To select multiple Sites, hold down Ctrl key while clicking the options)

Search
All Available EDRN Pilot Project Sites
Creighton University
H. Lee Moffitt Cancer Center



Key Accomplishments

- ☞ Deployed *science tools*
- ☞ *Multi-agency, multi-discipline* working groups and collaborations
- ☞ *National and International* Presentations and Publications
- ☞ Science-driven solutions benefiting both *cancer* and *planetary science* research
- ☞ *Seamless access* between seven EDRN research sites (including the DMCC)

Informatics Working Group Members

- Data Management and Coordinating Center, Fred Hutchinson Cancer Research Center
- H. Lee Moffitt Cancer Center
- University of Texas, San Antonio
- Creighton University
- University of Colorado
- University of Pittsburgh
- University of Michigan/Dartmouth University (Great Lakes New England Consortium)
- Brigham and Womens Hospital
- New York University
- MD Anderson, University of Texas
- Cancer Biomarkers Group, NCI
- NASA Jet Propulsion Laboratory

More Information and References

- Information about the JPL OODT Project (http://oodt.jpl.nasa.gov)
- Information about the Planetary Data System (http://pds.jpl.nasa.gov)
- Information about the Early Detection Research Network (http://edrn.nci.nih.gov)
- Dublin Core (http://purl.oclc.org/dc)
- Extensible Markup Language (http://www.w3c.org/XML)