



caBIG & Web 2.0:

Service Integration & Federated Querying in the CardioVascular Research Grid (CVRG)

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CVRG Recap



- **Community resource for semantic description, distributed management & analysis of primary & derived CV data**
- **Re-use or extend components from other BioGrid projects (e.g., BIRN & caBIG)**
- **Let the CV community drive technology development**

Re-use/Extension of caBIG/caGrid tools



- **Contribution of XML data service extension to caGrid Introduce (Tony Pan Day 3)**
- **Use of caGrid Introduce to create interoperable data & analytic services**
 - SNP data service uses components from the CGEMS data model
 - ProteinDB registered with caDSR & service developed with caCORE/Introduce
- **One of the first non-caBIG deployments of WebSSO/LifeRay (caGrid) Portal**
- **Integration of geWorkBench/RWebServices for submission/retrieval of data analyzed by R scripts**
 - geWorkBench = genomics analysis interface
 - RWebServices = Apache Axis Web Service

Web 2.0 Portals



- **Content aggregation in server-side presentation-tier manner**
- **Portlets generate markup & Portal aggregates markup fragments**
 - Content change requires Portal refresh (e.g., changing tabs)
- **Information presented side-by-side**
 - Results in multiple portlets per Portal tab

Web 2.0 Mashups



- **Combine data or functionality from external sources, making new applications**
- **Content aggregation can take place on either the server or the client**
- **Operation on pure XML content and/or markup fragments**
- **Components can be placed in web pages or executed standalone**

Mashup Development Environments/ Biomedical Research Examples



- **Yahoo User Interface (YUI)**
 - Open-source Javascript library
 - Used by i2b2 in Web Client

- **Google Web Toolkit & API Library (GWT)**
 - Open-source Java project with plugin for Eclipse
 - Allows Java developers to produce rich Javascript tools without knowledge of syntax
 - Used by LabKey & WebProtege
 - Used by CVRG in Gadget development & deployment

CVRG ECG Gadget



- **Hybrid data storage/analysis workflow**
 - Converts between ECG formats on-the-fly
 - Analysis by two algorithms simultaneously
- **Visualization/annotation of ECGs with information outside of CVRG web services**
 - NCBO Bioportal (Trish Whetzel Day 3) REST calls for ECG concepts and definitions

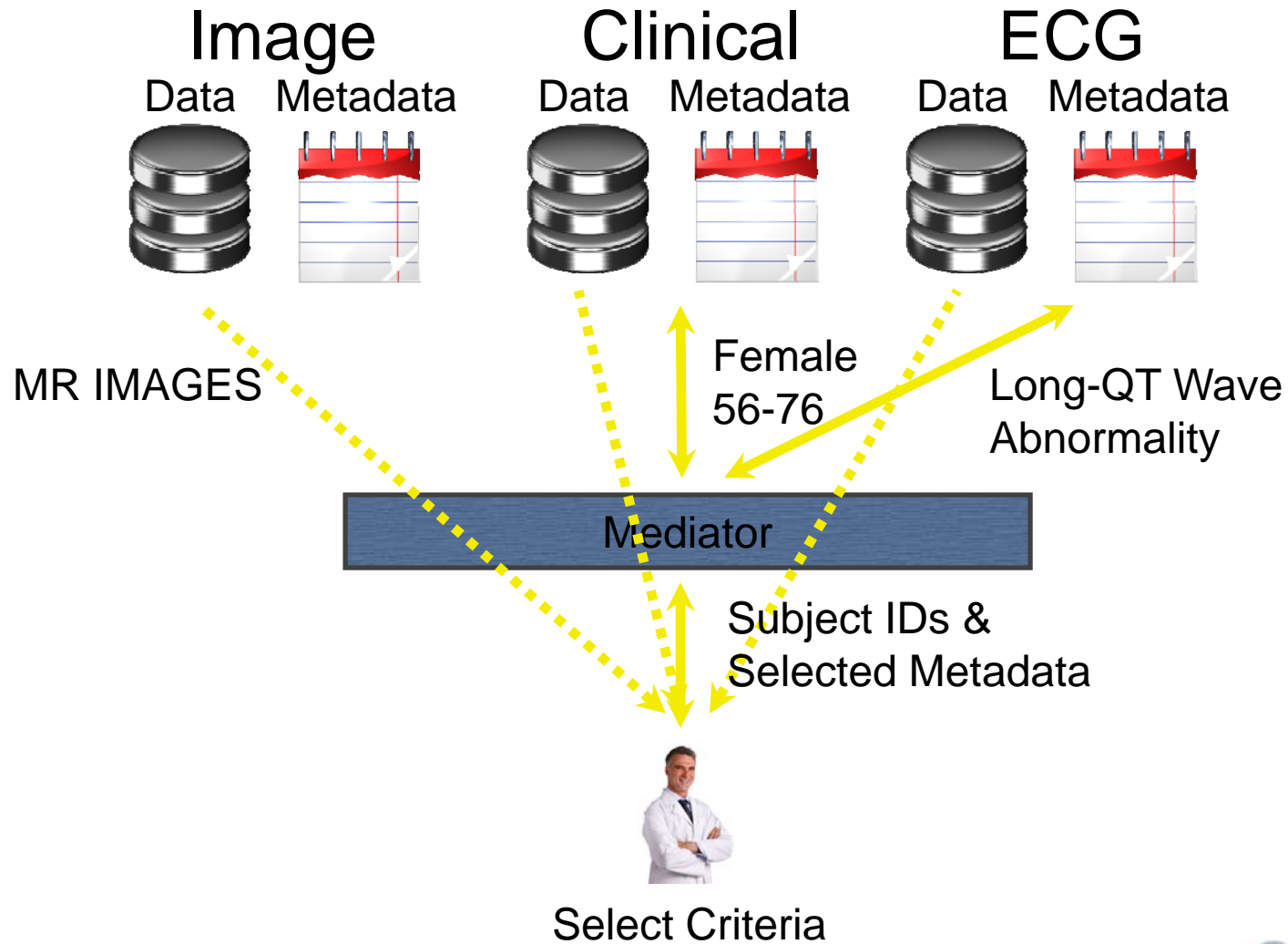
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CVRG Federated Query Gadget



- **Uses mobile agents**
 - Agents transport their state from one environment to another, preserving data
 - After transport, capable of performing appropriately in new environment
- **Integrates data from 3 disparate systems (Clinical (PostgreSQL), ECG (XML) & Imaging (mySQL))**
- **[Federated Query Gadget Demo](#) - [Click to View](#)**

Complex Queries - Approach



Benefits of Web 2.0 Mashups to caBIG/caGrid



- **No change required in the caBIG/caGrid infrastructure**
 - Mashup = Service-Oriented Architecture (SOA) thinking
 - Added flexibility in deployment choice
- **More choice placed in the hands of the user**
 - Dynamic workflow generation

Benefits of Mobile Agents to caBIG/caGrid



- **Agent data preservation helps security integration**
 - Can serialize/de-serialize Security Assertion Markup Language (SAML) and Endpoint References (EPRs) within agents
- **Flexible maintenance**
 - New agents/extension of actions require updates to agent code, not service hosts

Web References



- CVRG - <http://www.cvrgrid.org/>
- YUI - <http://developer.yahoo.com/yui/>
- i2b2 Web Client - <https://www.i2b2.org/>
- GWT - <http://code.google.com/webtoolkit/>
- LabKey - <https://www.labkey.org/>
- WebProtege - <http://protegewiki.stanford.edu/index.php/WebProtege>
- NCBO Bioportal – <http://bioportal.bioontology.org/>

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