

# Federated Registries: Issues and Approaches

ADL Implementation Fest  
Aug 2009

Larry Lannom  
Corporation for National Research Initiatives

<http://www.cnri.reston.va.us/>

<http://www.handle.net/>

# Report Documentation Page

Form Approved  
OMB No. 0704-0188

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE <b>AUG 2009</b>		2. REPORT TYPE		3. DATES COVERED <b>00-00-2009 to 00-00-2009</b>	
4. TITLE AND SUBTITLE <b>Federated Registries: Issues and Approaches</b>				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>Corporation for National Research Initiatives,1895 Preston White Drive ,Reston,VA,20191</b>				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES <b>ImplementationFest2009, 18-20 Aug 2009</b>					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>Same as Report (SAR)</b>	18. NUMBER OF PAGES <b>14</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

# Federation

- Federation within and across information systems is useful when
  - a set of *varying features* exists across the federates – the origin of the multiplicity
    - Includes organizational boundaries, locations, content types, etc.
  - a set of common features exists across federates – providing the value of federation
    - Shared topics, common audience, etc.
- Federation has two goals
  - Increase overall utility of the system(s) by leveraging the shared functions/features
  - Keep the distinct features of the federates, lowering barriers to collaboration and increasing overall flexibility

# CORDRA

- CORDRA provides a common system/service to identify, register, and discover objects that
  - are distributed across various organizations and systems
  - are created and archived using different models/structures
  - are accessible to users through diverse mechanisms
  - but when federated form a coherent collection, i.e., the federated objects share a common information domain catering to audience interested in the collection
- Challenges in enabling CORDRA are two fold:
  - Conceptual
  - Technical

---

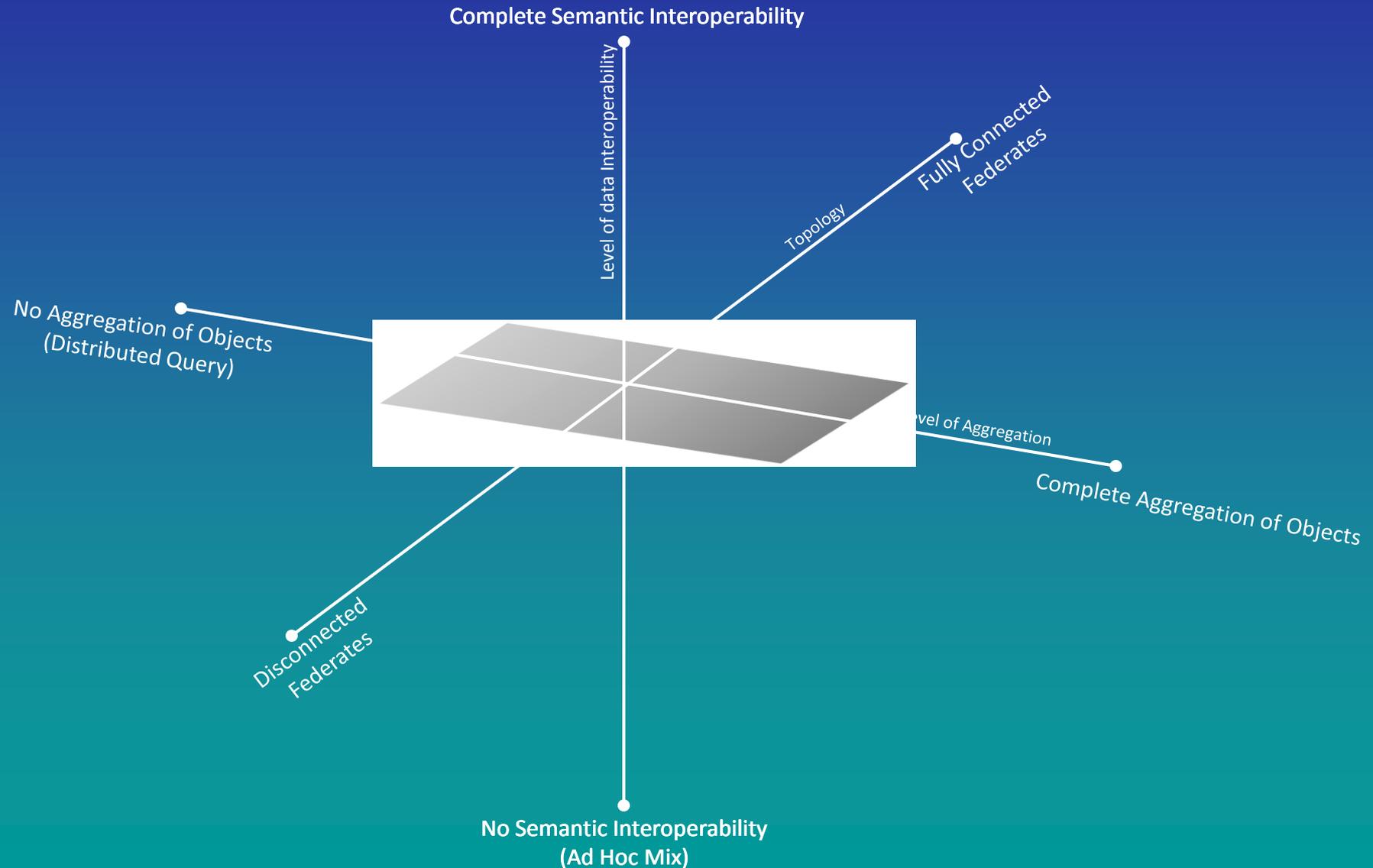
 Varying features

 Common features

# Challenges - Conceptual

- Identifying the type of aggregation:
  - Should we aggregate objects ahead of time, before any query?
  - Should we merge search responses from federates by issuing a distributed query?
  - Something in between?
- Identifying the level of semantic interoperability
  - Do we enforce complete semantic interoperability across all the data stored in the federates?
  - Do we use only the least common denominator (from a data semantics point of view) among the federates?
- Identifying the topology
  - Are all federates directly connected to each other? (fully-connected mode)
  - Is each federate connected to only its neighbor? (peer-peer mode)
- These criteria can be visualized as a *Federation Spectrum*
- Timeliness and Access Control are crosscutting issues

# Role of Identifier Resolution Systems in Information Management on Networks



# CORDRA Goal: One Definition

Define a framework that can be customized for federation of repositories and registries that covers all possibilities shown in the Federation Spectrum

# Challenges - Technical

Depending on the criteria chosen for federation, various technical requirements arise, including:

- Design a data model to aggregate multiple metadata instances describing a single object
- Design cross-walking algorithms to translate and map heterogeneous data into a common model
- Design a query model to gather and rank search results from multiple federates
- Ensure scalability, reliability, and security without compromising performance

# Digital Object Registry (basis for ADL Registry)

- Provides a *data model* to encapsulate related metadata instances together
- Enables aggregation of objects from *fully-connected* mode to *peer-peer* mode
- Uses the Handle System to uniquely and security identify objects and metadata instances across all federates

# M-FASR Phase II Federation

- Use the Digital Object Registry to federate LMS repositories and ADL Registry by
  - assuming “complete semantic interoperability” of metadata
  - using aggregation mode, i.e., aggregate metadata from the ADL Registry and participating repositories at a Registry of Registries (RoR)
- Discover distributed content by searching the RoR and aggregating the discovered content into a course demonstrating the
  - Reuse of existing content to reduce cost and time
  - Repurposing of original content to meet new requirements



# Future Work

- Semantic Interoperability
  - Identify a framework/mechanism for dealing with data semantics in a federation, e.g., federation specific ontologies to identify, process, and crosswalk federate specific ontologies and data
- Distributed Query and Index Aggregation
  - Look to existing IR techniques to rank search results from distributed federates
  - Aggregate indices (instead of the raw metadata) from distributed federates to optimize propagation traffic

# Recent Experience

- Added dimensions to the federation challenge, beyond aggregation – topology and semantics
- Variable timeliness and depth of metadata add to the challenge
- Network and system limitations are significant in a government environment
- Meta-meta significant for aggregation – can't just combine search results – need context
- Registry of Registries now works, at least in its simplest mode

# Other DO Registry/Repository Projects

- Global Environment for Network Innovations (GENI), a NSF research program, is using the DO Registry for providing clearinghouse and information management services mainly to register and discover networking resources
- DARPA Network Archive (DNA), a DARPA research program, is using the DO Repository and Registry for providing distributed storage facilities in a secure manner

# Generic Registry

- We are planning on releasing the DO Registry codebase with an open source license shortly
- That codebase (aka generic registry) is a registry software package that can easily be customized to different communities and needs
- Development is completed
- Documentation efforts are ongoing