DataONE/DAP Server

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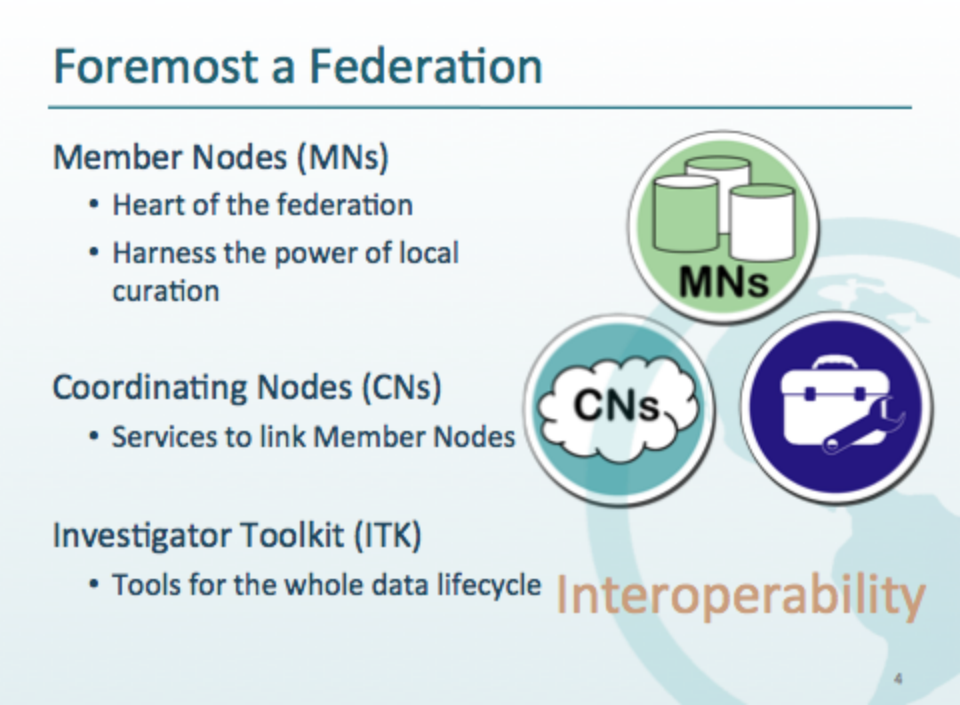
*With lots of help from the DataONE developers

About DataONE

- Web servers provide access data
- They also provide a data location service
- And an 'upload' service
  - data are added using the servers
  - it's not a read-only system

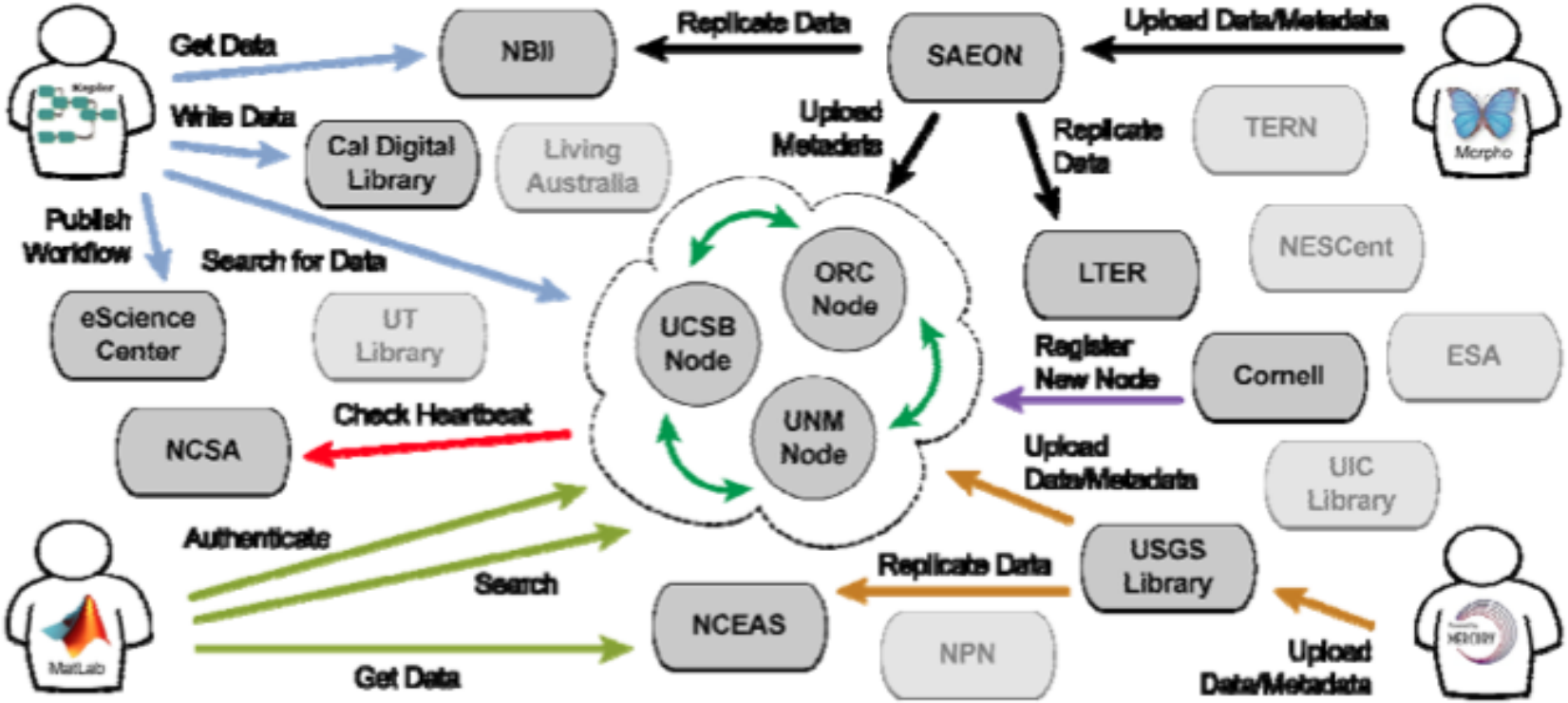
More About DataONE...

- DataONE supports authorization and ...
- Anonymous access
- It also supports Data Replication
- Supports dataset versions and ...
- Old versions are not deleted



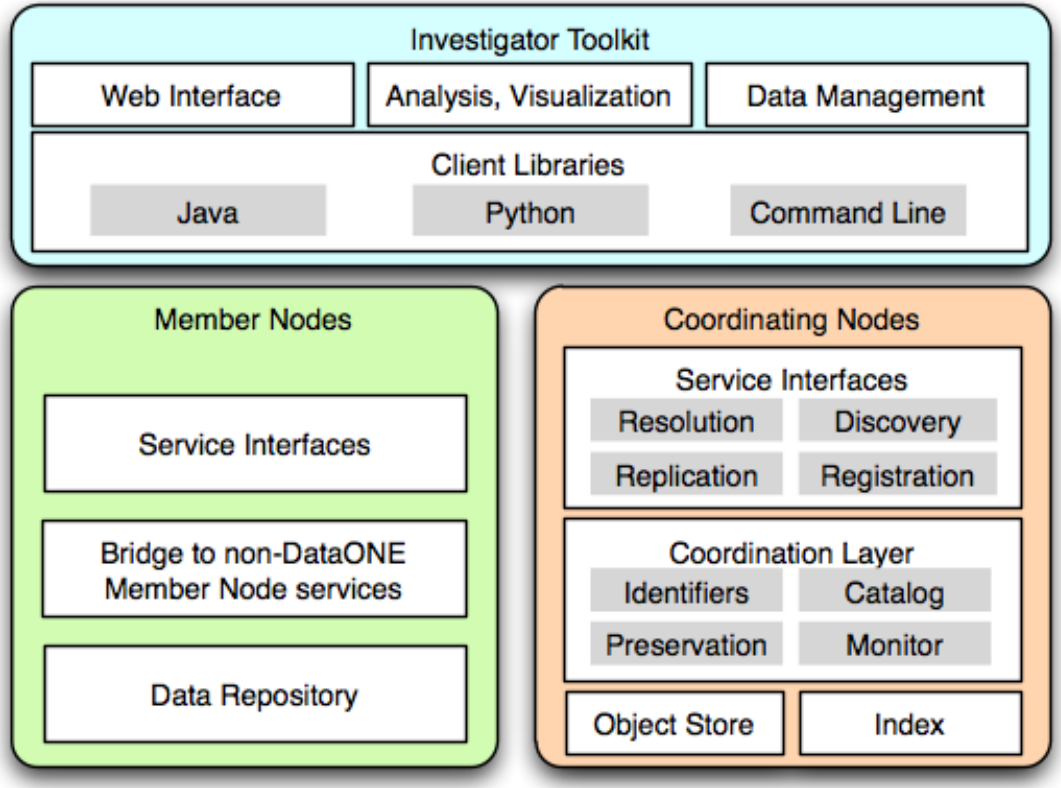
DataONE in a Nutshell*

*Thanks to Matt Jones for this slide



What DataONE* looks like

*Stolen from the DataONE web site



Software Components that make up DataONE*

*Stolen from the DataONE web site

The DataONE Member Node APIs

Tier 1: Core, Read, [Query, View, Package]

Get Data and information about data

Tier 2: Authorization

Limit access to the server or specific data sets

Tier 3: Storage

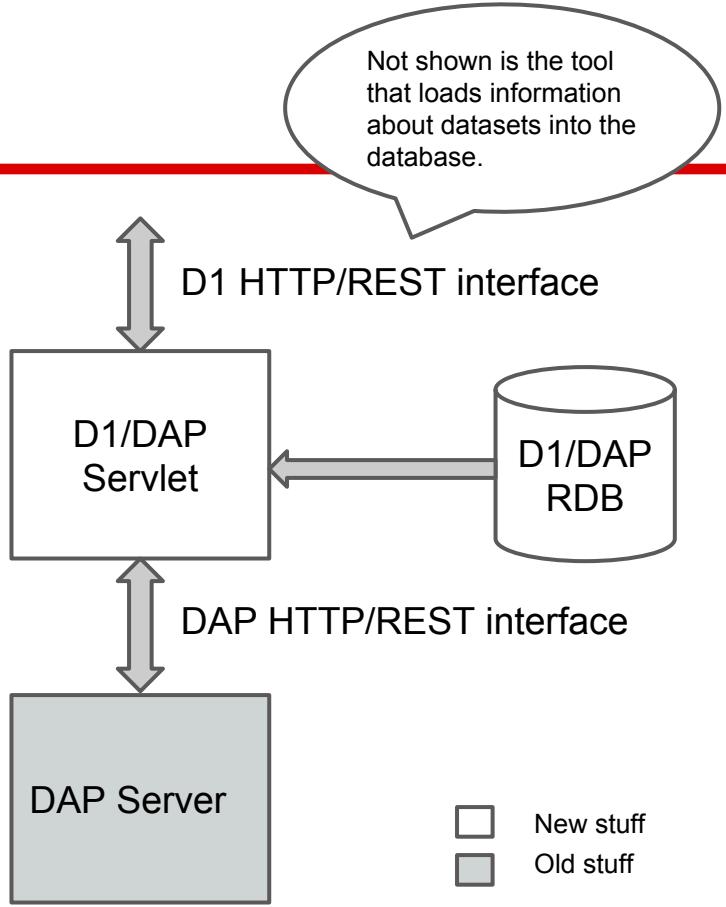
Add data to the Member Node

Tier 4: Replication

Instruction from a Coordinating Node to replicate data

What We Did

- Tier 1 Member Node
  - Core and Read APIs
- It will work with *any* DAP server that can return ISO 19115 docs and netCDF
- Open Source*
- Small: ~700 LOC; 8 source files
- Not 100% complete



*https://scm.opendap.org/svn/trunk/D1

How does it work?

- Servlet processes D1 requests
- A request is handled using information from the database and/or the DAP server
  - The DB holds 'D1 metadata'
  - The DAP server holds dataset data/metadata
- A separate program is used to add datasets to the database

Operation - setup, harvest

- Use the standalone program to add datasets to the database
  - This will use information from the DAP server to build D1 'system metadata'
- A D1 Coordinating Node (CN) asks the Servlet for information about its datasets (system metadata)
- The CN then reads the dataset metadata

Operation - clients

- Clients search the CN for datasets
- They find the URLs for data the server holds
- They get the Data and Metadata

Limitations - implementation

- Only ISO 19115 dataset metadata
  - but D1 supports many other formats
- All data returned in netCDF3 files
  - again, D1 supports other formats
  - more about this in a bit...
- Many features of DAP are not used
- Only D1 Tier 1 and only the required APIs

A few other limitations

- The program that adds datasets to the database is very limited
- Some very large datasets will fail
- The ping() function of the D1 Core API may return misleading (false positive) results - it tests only one DAP server
- However, these are not the most important limitations

System Differences

- DAP and DataONE *solve different problems*
- DAP is a *protocol*
  - format independence
  - subsetting
- DataONE is a *system*
  - persistence (replication, version management)
  - dataset location (CN/MN architecture, metadata harvesting)
- This makes combining them interesting!

The Hard Parts

- Subsetting
- Aggregation
- Persistence
- Cataloging

Subsetting

- DAP supports subsetting using a data model like most programming languages
- To use this, DAP's 'system metadata' describes a dataset's internal *structure*
- DataONE's metadata describes the internal *content*
- Solution: Add service APIs as a datatype to DataONE (but that's not simple)

Aggregation

- Some DAP datasets are large collections of files: O(10k)
  - Aggregation supported for a some of these
  - Access to the entire dataset not pragmatic - it must be subset
- DataONE uses ORE (Object Reuse and Exchange)
  - Aggregates more *types* of datasets
  - Cannot support large numbers of files

Persistence

- DAP knows nothing about versions - that idea is out of scope for the protocol
- DAP is an access protocol, not a system, so it cannot manage lifetimes
- We could (should?) combine DAP with other tools to add these capabilities

Cataloging

- DAP servers typically have catalogs that are hierarchical
  - ERDAP is system that uses relational catalogs
- DAP catalogs do not support relational queries
- DataONE depends on relational queries to crawl servers and provide clients with a data location service - DAP has none

Conclusion: Subsetting and Aggregation

- DataONE could be extended to support service APIs - as a 'return type'
- But, this is a major change for the *clients*
- Aggregation can also be a service API
- But the return type will be a set of URLs that will then be accessed in succession

Conclusion: Cataloging and Persistence

- Existing DAP catalogs can be crawled and a RDB populated
- The RDB can support a query interface
- This RDB can support persistence
- There is no likely (short-term) solution for DAP datasets that are deleted
- Replication of large datasets is not pragmatic