Policy Based Data Management

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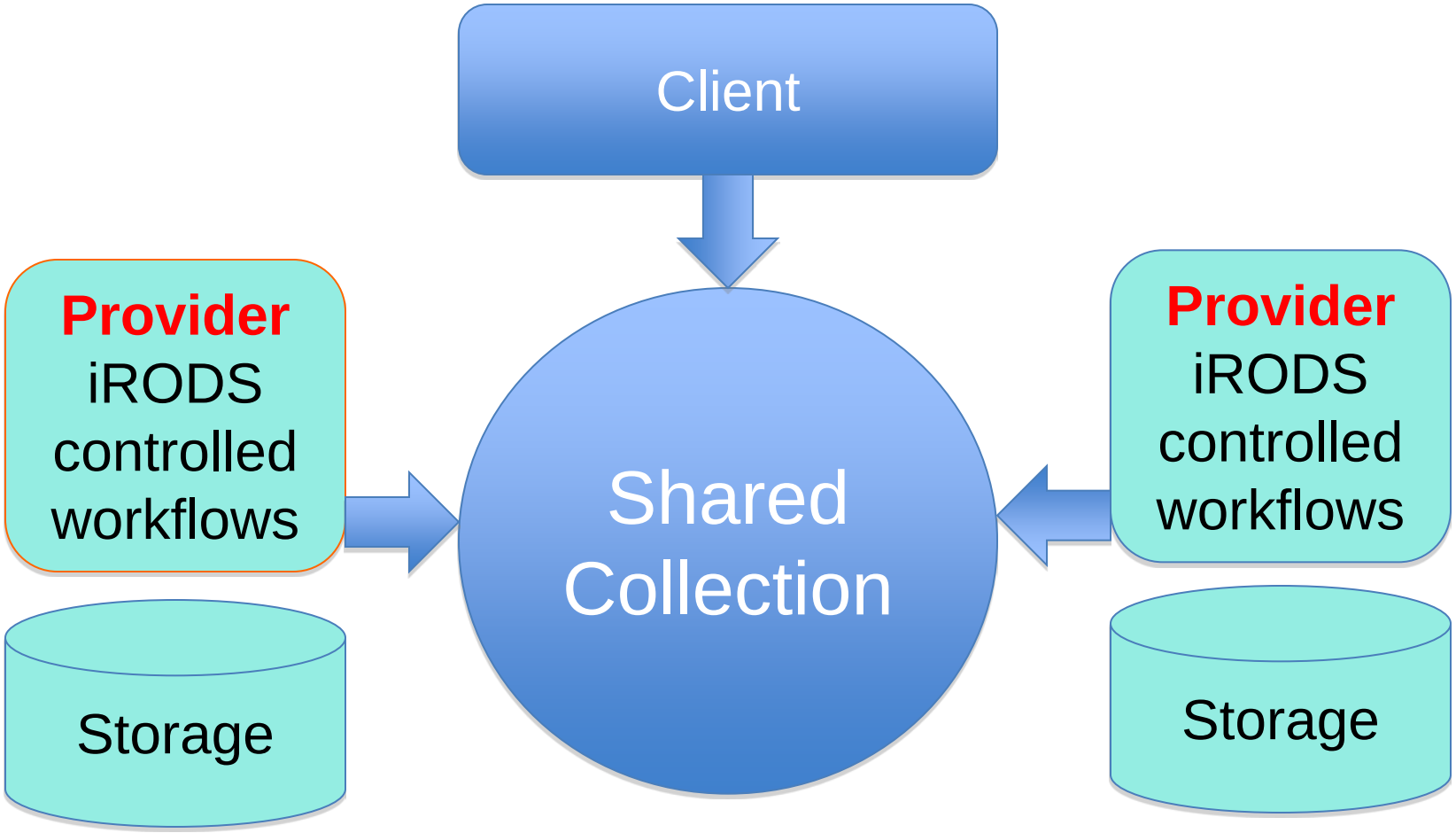
Policy-based Data Environments

- *Purpose* - reason a collection is assembled
- *Properties* - attributes needed to ensure the **purpose**
- *Policies* - controls for enforcing desired **properties,**
- **mapped to computer actionable rules**
- *Procedures* - functions that implement the **policies**
- **mapped to computer actionable workflows**
- *Persistent state information* - results of applying the **procedures**
- **mapped to system metadata**
- *Assessment criteria* - validation that **state information** conforms to the desired **purpose**
- **mapped to periodically executed policies**

Policy-based Data Sharing

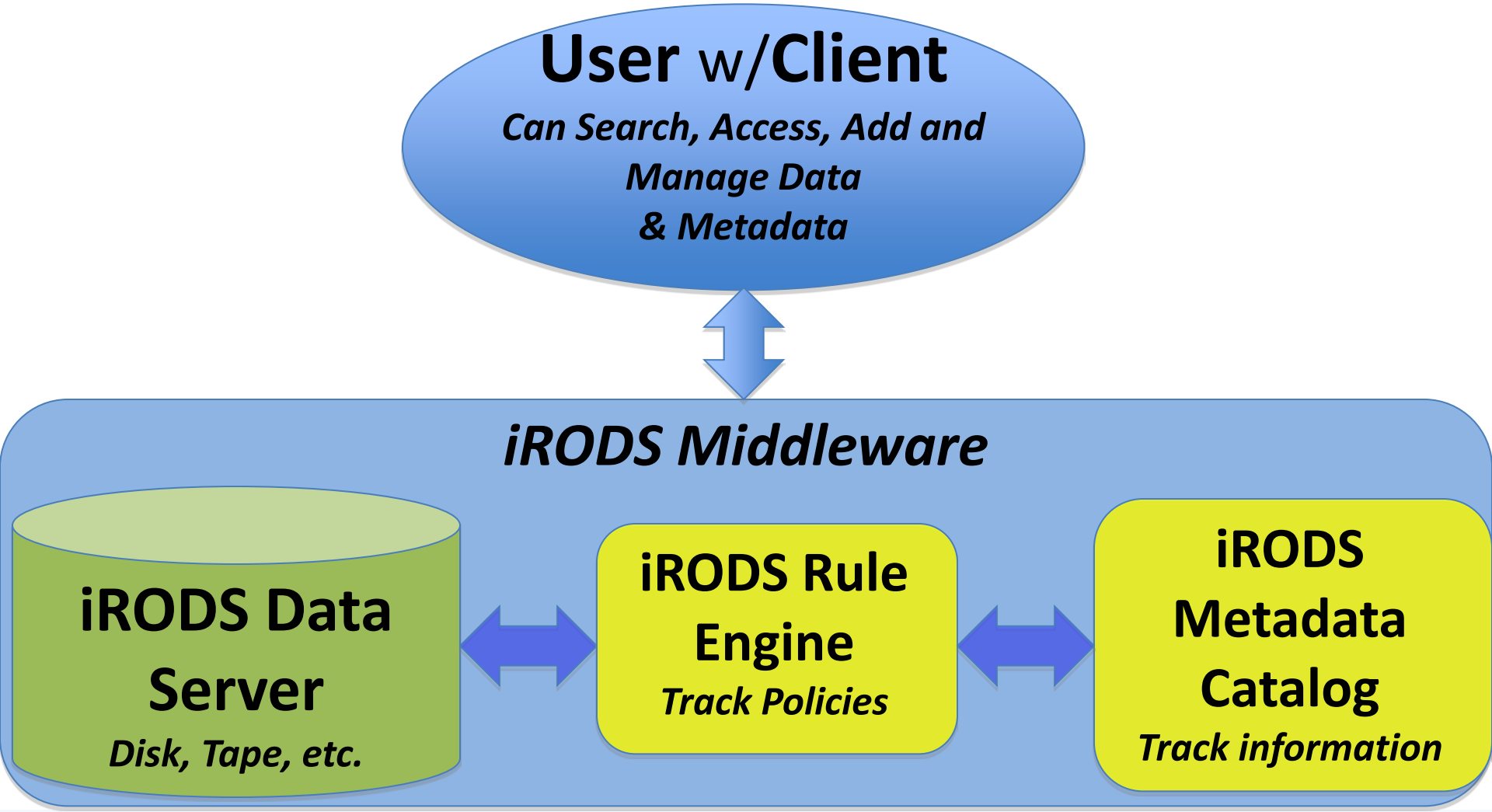


Consensus on Policies and Procedures controlling the shared data

Applications

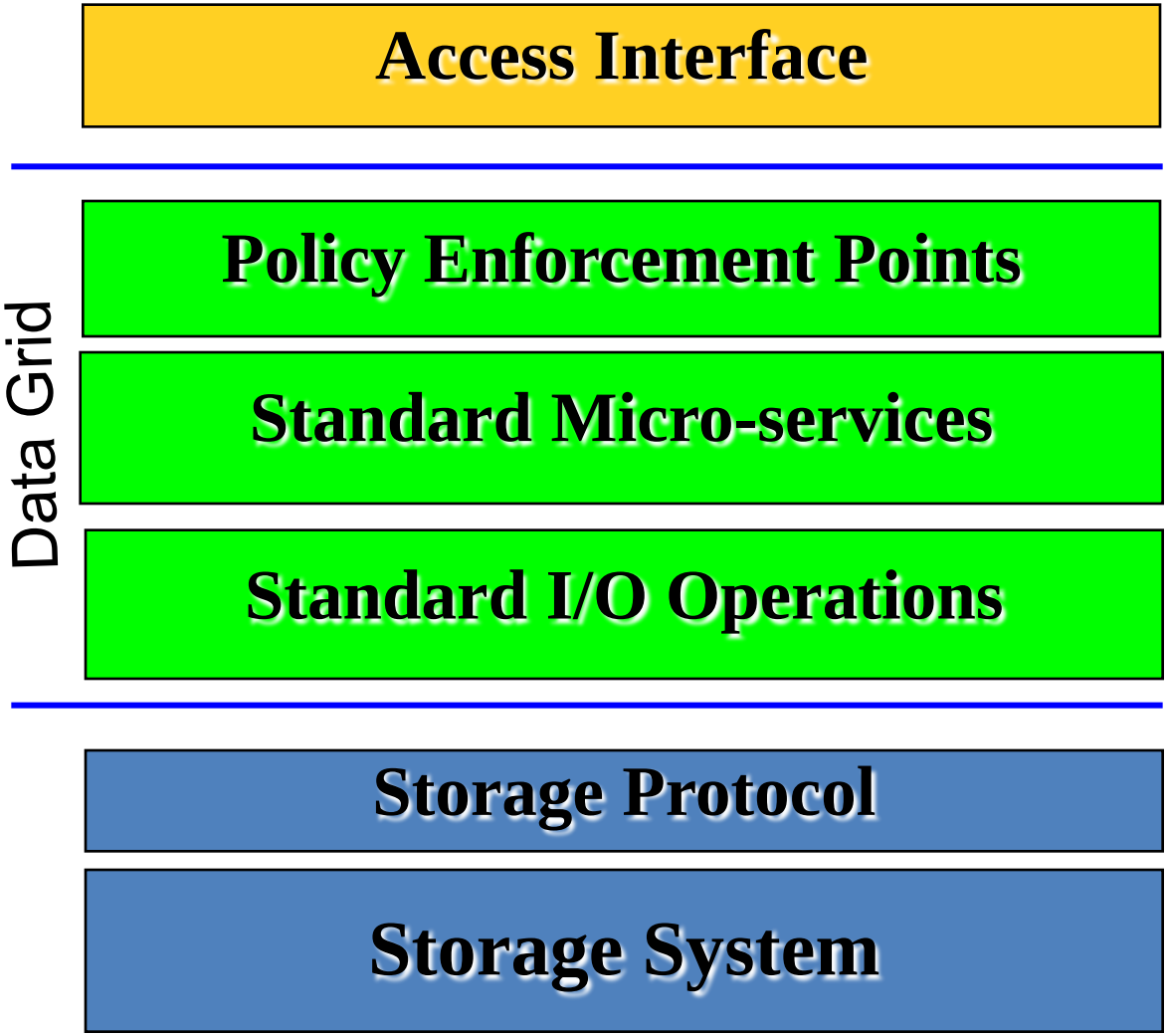
- Data grids – PB-size distributed collections
  - Astronomy – NOAO, CyberSKA, LSST
  - High Energy Physics – BaBar, KEK
  - Earth Systems – NASA (MODIS data set)
  - Australian Research Collaboration Service
- Institutional repositories
  - Carolina Digital Repository
- Libraries
  - Texas Digital Libraries
  - Seismology - Southern California Earthquake Center
- Archives
  - Ocean Observatories Initiative

Overview of iRODS Architecture



Access distributed data with Web-based Browser or iRODS GUI or Command Line clients.

Data Virtualization



Map from the actions requested by the client to multiple policy enforcement points.

Map from policy to standard micro-services.

Map from micro-services to standard Posix I/O operations.

Map standard I/O operations to the protocol supported by the storage system

iRODS Components

- Clients – currently 48
  - Browsers / Digital library / File system / Grid tools / I/O libraries / Portal / Unix tools / Web services / Workflows
- Policy enforcement points – currently 71
  - Manage policies controlling actions, pre-action policies, and post-action policies
- Distributed rule engine
  - Control rule execution
  - Manage deferred and periodic policies

Highly Controlled Environment

- All accesses are authenticated
  - GSI / Kerberos / Challenge-response / Shibboleth
- All operations are authorized
  - ACLs on files, storage
  - Constraints on each rule
- Local rule base controls interactions with local storage
  - Local rules are enforced first

iRODS Extensible Infrastructure

- Clients – specific to discipline and life cycle state
- Policies – specific to discipline
- Procedures – specific to discipline
- Remaining infrastructure is generic
  - Network transport
  - Authentication / Authorization
  - Distributed storage access
  - Remote execution
  - Metadata management
  - Message passing
  - Rule engine

Capabilities

- Replication
- Registration of files into the data grid
- Synchronization of remote directory
- Managed file transport (iDrop)
- Automated metadata extraction
- Queries on metadata, tags
- Server-side workflows (loop over result sets)
- Parallel I/O streams & RBUDP transport

Policies

- Retention, disposition, distribution, arrangement
- Authenticity, provenance, description
- Integrity, replication, synchronization
- Deletion, trash cans, versioning
- Archiving, staging, caching
- Authentication, authorization, redaction
- Access, approval, IRB, audit trails, report generation
- Assessment criteria, validation
- Derived data product generation, format parsing
- Federation of independent data grids

Open Source Software

- Community driven software development
  - Focus on features required by user communities
  - Focus on bug-free software
  - Focus on highly reliable software
  - Focus on highly extensible software
  - Approximately 3-4 software releases per year
- Distributed under a BSD license
  - International collaborations on software development
  - IN2P3 (France), SHAMAN (UK), ARCS (Australia), Academia Sinica (Taiwan)

iRODS - Open Source Software

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NSF OCI-0848296 "NARA Transcontinental Persistent Archives Prototype"
NSF SDCI-0721400 "Data Grids for Community Driven Applications"

13