E-iRODS Composable Resources

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Plugin Architecture

- Defines a common plugin interface
- Concentrates functionality into independently testable units
- Affords independent community development of new features external to the core
- Enables distribution of proprietary plugins in a binary-only format
- Affords the ability that plugins are dynamically available to a running server upon installation
- Includes a “ContextString” as flexible metadata which allows each instance of a plugin to be independently configured
- Enables multiple instances with different specific parameterization (e.g. multiple WOS, S3, etc. per E-iRODS server)

Resource Plugins

- Follow existing common iRODS file driver interface (fileOpen, fileClose, fileRead, fileWrite, etc.)
- Use the “ContextString” to define resource-specific metadata (e.g. S3 endpoint, WOS URL and port, path to local credential file)
- Capture complexity of resource behavior into reusable components
- Repackage existing functionality into plugins

E-iRODS Composable Resources

RENCI has developed composable resources for Enterprise iRODS (E-iRODS) which allow for shareable, flexible definitions of storage resources. Using a well-defined tree metaphor to describe composite resources provides insight into existing resources as well as a powerful tool for envisioning new resource configurations. Defined resources can be shared and iterated within the community easily as they are plugins, external from the E-iRODS core.

- Plugins
- Tree Metaphor
- Virtualization
- Extensible
- Community Driven

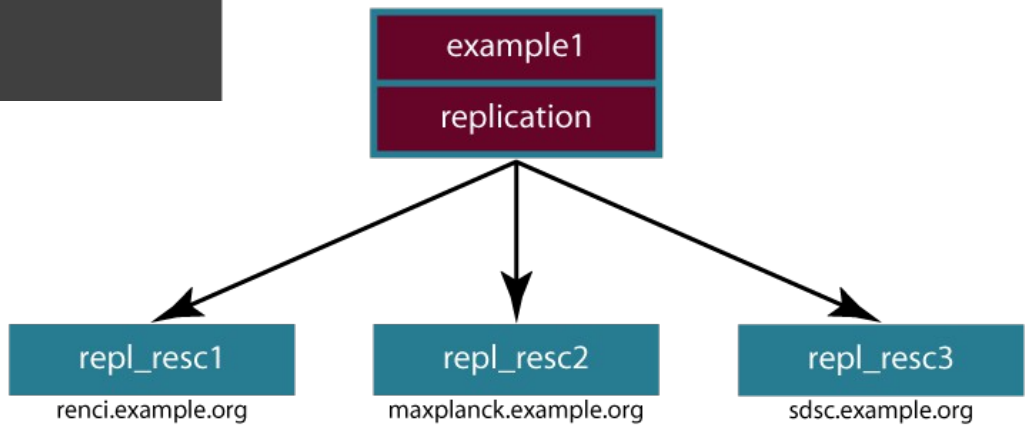
Example 1: Replicates Data Objects to three locations

Coordinating Resource – Strictly virtual (lives in the iCAT only)

It is the coordinating resource's responsibility to provide a "voting" mechanism for which replica is returned when the Data Object is requested by a user (i.e. iget).

This voting could be as simple as returning the first replica in the iCAT database or as complicated as keeping statistics on throughput or load or latency.

```
01 $ iadmin mkresc example1 replication
02 $ iadmin mkresc repl_resc1 "unix file system" renci.example.org:/Vault
03 $ iadmin mkresc repl_resc2 "unix file system" maxplanck.example.org:/Vault
04 $ iadmin mkresc repl_resc3 "unix file system" sdsc.example.org:/Vault
05 $ iadmin addchildtoresc example1 repl_resc1
06 $ iadmin addchildtoresc example1 repl_resc2
07 $ iadmin addchildtoresc example1 repl_resc3
```



Example 2: Tiered storage system with a dark archive

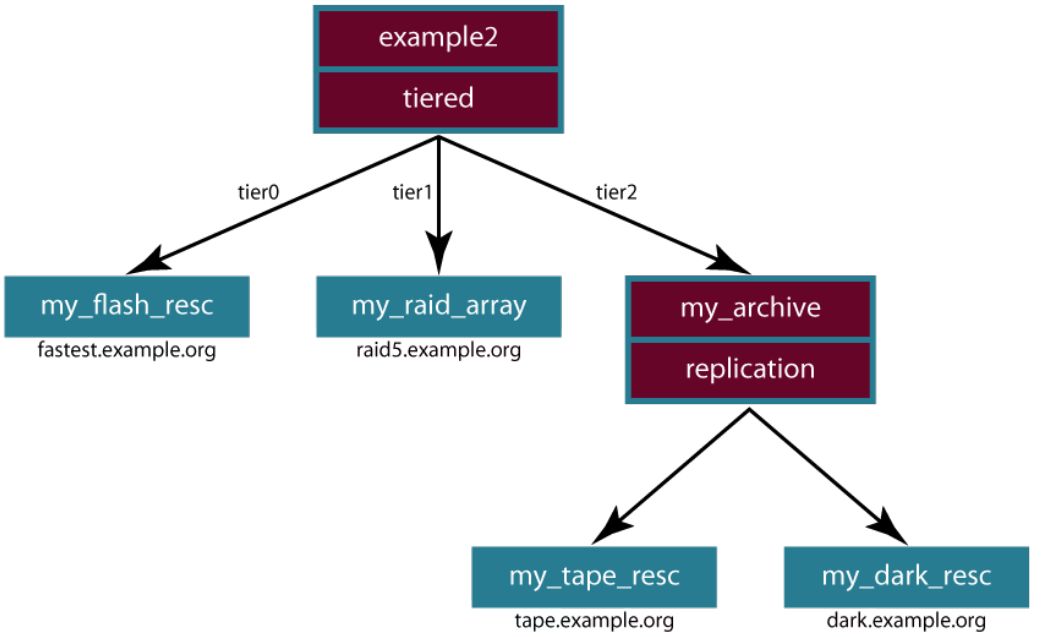
The relationship between a parent and child resource may also be defined with a ContextString.

Here, the three children of the tiered coordinating resource are ordered by speed with the fastest tier0 being a flash device, tier1 being a regular raid array of spinning disk, and a third tier2 being a replication coordinating resource with two children of its own.

The tier2 "my_archive" is replicating onto a tape device of some kind as well as a write-only space known as a dark archive.

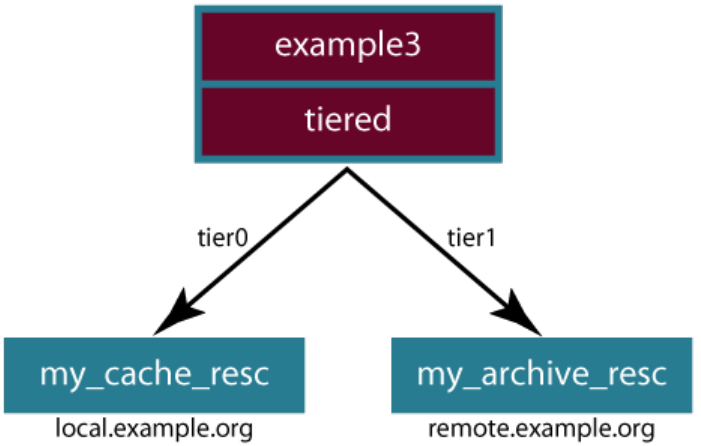
This "my_dark_resc" could have policy around it specifying that only admins can write, and no user can read. A dark archive would then always "vote" "no" requiring its parent to coordinate its own vote when responding to its own parent.

```
01 $ iadmin mkresc example2 tiered
02 $ iadmin mkresc my_flash_resc "unix file system" fastest.example.org:/Vault
03 $ iadmin mkresc my_raid_array "unix file system" raid5.example.org:/Vault
04 $ iadmin mkresc my_archive replication
05 $ iadmin mkresc my_tape_resc "unix file system" tape.example.org:/Vault
06 $ iadmin mkresc my_dark_resc "unix file system" dark.example.org:/Vault
07 $ iadmin addchildtoresc example2 my_flash_resc "tier0"
08 $ iadmin addchildtoresc example2 my_raid_array "tier1"
09 $ iadmin addchildtoresc example2 my_archive "tier2"
10 $ iadmin addchildtoresc my_archive my_tape_resc
11 $ iadmin addchildtoresc my_archive my_dark_resc
```



Example 3: Simulates legacy compound resource type

```
01 $ iadmin mkresc example3 tiered
02 $ iadmin mkresc my_cache_resc "unix file system" local.example.org:/Vault
03 $ iadmin mkresc my_archive_resc "unix file system" remote.example.org:/Vault
04 $ iadmin addchildtoresc example3 my_cache_resc "tier0"
05 $ iadmin addchildtoresc example3 my_archive_resc "tier1"
```



The local "my_cache_resc" would be consulted first for any read request that comes into "example3".

A write request would go into the cache resource first as well and then be replicated to its peer, the remote "my_archive_resc".

This example can duplicate the existing functionality of the compound resource as defined in community iRODS.

Thank You

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