

iRODS Micro-Services

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1

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Implications

- iRODS policies are enforced at the remote storage location
- Equivalent of a distributed operating systems is needed
 - State information
 - In-memory data structures
 - Message system
 - Rule queuing
 - Scheduling
 - Remote execution

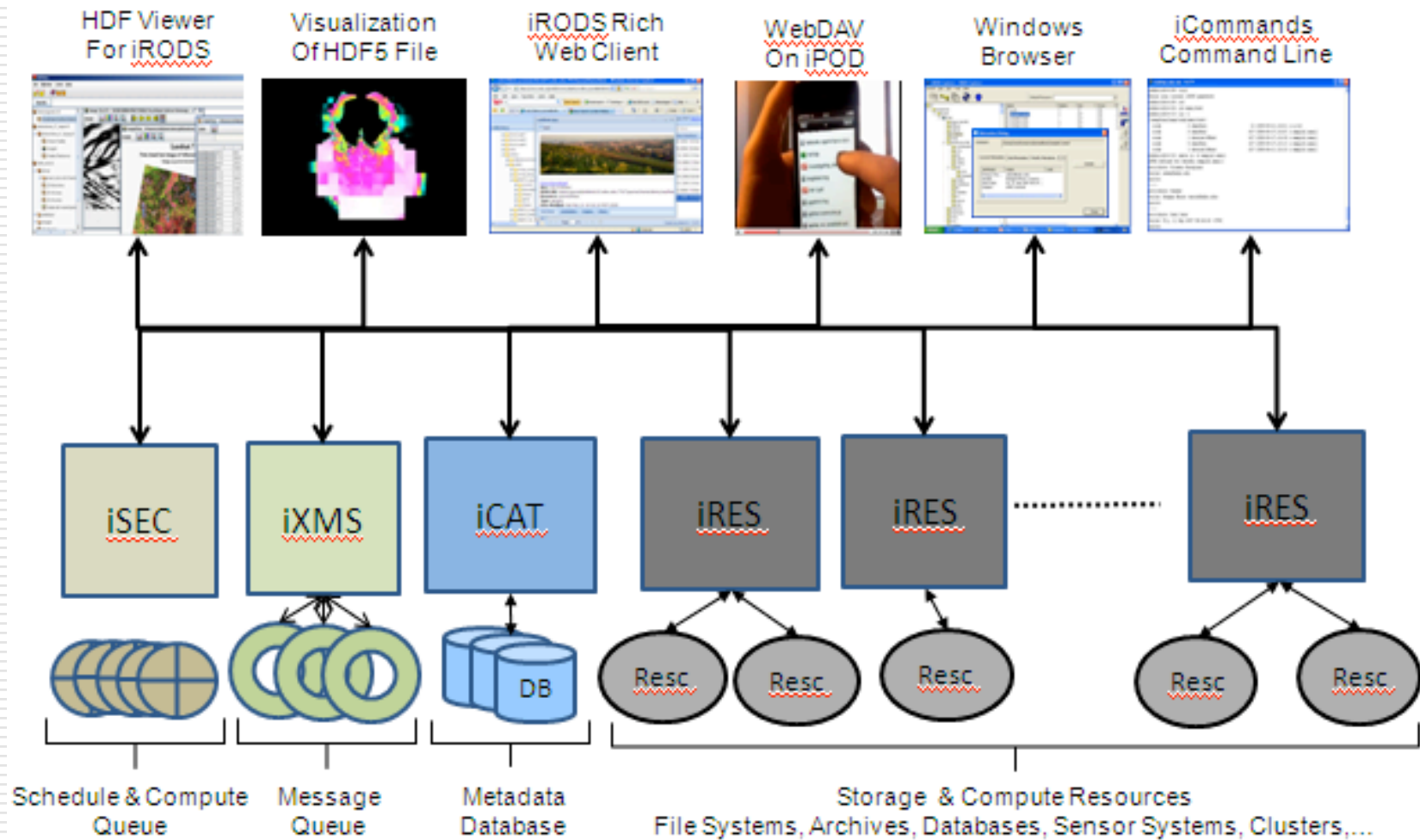


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iRODS - Distributed Operating System



Simplification

- Compose well-defined procedures
 - Control execution of procedures through computer actionable rules
- Remote procedures constructed by chaining micro-services together
 - Micro-services are functions encoded in C
 - Strongly “typed”, explicit knowledge of the information structures used by each micro-service
 - Explicit names for state information



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List of Micro-services (~185)

- irule -F listMS.ir

List_Available_MS

```
{  
    msiListEnabledMS(*KVPairs)  
    writeKeyValPairs(stdout, *KVPairs, ": ")  
}  
INPUT *A=null  
OUTPUT ruleExecOut
```

Micro-Service Examples

- msiDataObjRepl
- msiDataObjCopy
- msiGetObjType
- msiAssociateKeyValuePairsToObj
- msiExtractTemplateMDFromBuf
- msiCollCreate
- msiNoTrashCan
- delayExec
- remoteExec
- forEachExec
- msiSleep
- writeLine



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Variables

- Variables, used to describe input and output parameters
 - Labeled with an "*"
- Session variables, used to define attributes related to the session
 - List of available session variables in iRODS Primer
 - Labeled with a "\$"
- Persistent state variables, used to define attributes that are permanently stored in iCAT metadata catalog
 - List of available persistent state variables in iRODS Primer



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Session Variables

- Availability depends upon the action that is being performed
- Interactive rule execution provides a limited set of session variables
 - `userNameClient`
 - `rodsZoneClient`
- If invoke an action related to file manipulation, get session variables for
 - `objPath`
 - `replNum`
 - `dataSize`
 - `chksum`



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Persistent State Variables

- Can be listed using the icommand
 - `iquest attrs`
- Examples include
 - `DATA_NAME`
 - `DATA_SIZE`
 - `DATA_CHECKSUM`
 - `DATA_PATH`
 - `DATA_REPL_NUM`
 - `DATA_RESC_NAME`
 - `DATA_VERSION`



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Implication - Structured Information

- Each micro-service ingests and outputs structured information
 - Explicit in-memory data structures defined for exchanging structured information
 - Need to check micro-service is being given the correct data structure type
- Doxygen lists the structures used for each micro-service



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Data Checksum Micro-service

- `msiDataObjChksum` (`msParam_t *` `inpParam1,`
- `msParam_t *` `msKeyValStr,`
- `msParam_t *` `outParam,`
- `ruleExecInfo_t *` `rei`
-)
- [in] `inpParam1` - A `DataObjInp_MS_T` or a `STR_MS_T` which would be taken as `dataObj` path.
- [in] `msKeyValStr` - Optional - a `STR_MS_T`. This is the special `msKeyValStr` format of `keyWd1=value1++++keyWd2=value2++++keyWd3=value3...`. If the `keyWd` is not specified (without the '=' char), the value is assumed to be the target resource ("`destRescName`") for backward compatibility. Valid `keyWds` are:
 - * "`ChksumAll`" - checksum all replicas. This `keyWd` has no value. But the '=' character is still needed.
 - * "`verifyChksum`" - verify the `chksum` value.
 - * "`forceChksum`" - checksum data-objects even if a checksum already exists in iCAT. This `keyWd` has no value.
 - * "`replNum`" - the replica number to checksum. This `keyWd` has no value.
- [out] `outParam` - a `STR_MS_T` containing the `chksum` value.
- [in,out] `rei` - The `RuleExecInfo` structure that is automatically handled by the rule engine.



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Infrastructure Independence

- Micro-services manipulate structures in memory
 - iRODS framework maps from requested I/O operations to Posix-style I/O
 - iRODS drivers map the Posix-style I/O to the specific storage protocol
- Implication
 - Same micro-service runs on Windows, Unix, Linux, Mac operating system
 - Procedures can be executed across any of the linked operating systems



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Migration of Micro-services

Access Interface

Map from actions requested by the access method to a standard set of Micro-services.

Standard Micro-services

Data Grid

Map the standard Micro-services to standard operations.

Standard Operations

Storage Protocol

Map the operations to protocol supported by the operating system.

Storage System

Wednesday afternoon

- Session on writing a new micro-service
- Developing a book that will list for each micro-service:
 - Input parameters / structures
 - Output parameters / structures
 - Persistent state information that is set
 - Operations performed upon files



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