



ARC Resource-coupled Execution Service (A-REX)

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KnowARC



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Outline

- Introduction to ARC, NorduGrid and KnowARC
- Implemented standards
- Basic Execution Service
 - Implemented features and extensions
- Job Submission Description Language
 - Implemented features and extensions
- A-REX current status

Introducing KnowARC

- ARC Resource-coupled Execution Service (A-REX) is part of **ARC1 middleware**
 - General purpose Open Source middleware
 - Developed & maintained by the NorduGrid Collaboration
 - Lightweight architecture
- A-REX is developed inside **KnowARC project**
 - 10 partners from 7 countries
 - Goal is to create a novel Next Generation Grid middleware based on previous pre-standard ARC (Classic)
 - Wide range of platforms - major Linux distributions, Solaris, Mac OS-X, Microsoft Windows
 - Based on open Grid standards and interoperable
 - Usage in Health care, Industry and Science



Know**ARC**

Implemented OGF standards

- GFD.108 OGSA® Basic Execution Service Version 1.0
 - Mostly implemented
- GFD.99 OGSA® Security Profile 1.0 - Secure Channel
 - HTTP over TLS
- GFD.56 Job Submission Description Language (JSDL) Specification v1.0
 - Subset of elements is supported
 - Work is in progress for achieving compliant behavior

Implemented OGF standards

- GFD.114 HPC Basic Profile, Version 1.0
 - Except BasicFilter extension
- GFD.111 JSDL HPC Profile Application Extension, Version 1.0
 - Supported elements:
 - *Executable*
 - *Argument*
 - *Input*
 - *Output*
 - *Error*

Other standards

- OASIS Web Services Resource Framework (WSRF)
 - WS-BaseFaults (WSRF-BF)
 - WS-ResourceProperties (WSRF-RP)
 - ***GetResourcePropertyDocument***
 - ***GetResourceProperty***
 - ***GetMultipleResourceProperties***
 - ***QueryResourceProperties***
- W3C Web Services Addressing (WS-Addressing)
- OASIS Web Services Security (WSS)
 - Username Token Profile 1.1

Basic Execution Service

- BES-Management Port Type - **not supported**
 - No remote service management
- BES-Factory Port Type - **supported**
- BES-Activity - **no operations defined**
- WS-Naming extension to WS-Addressing - not supported, ignored as BES specs require

Basic Execution Service

- BES Activity states
 - Pending - supported
 - Running - supported
 - Finished - supported
 - Terminated - not supported.
 - All canceled jobs are considered as failed by A-REX.
 - Failed - supported

Basic Execution Service

- BES-Factory **supported** attributes
 - IsAcceptingNewActivities - always "true".
 - CommonName
 - LongDescription
 - TotalNumberOfActivities
 - ActivityReference
 - LocalResourceManagerType
 - BESExtension
 - <http://www.nordugrid.org/schemas/a-rex>
 - NamingProfile
 - <http://schemas.ggf.org/bes/2006/08/bes/naming/BasicWSAddressing>.

Basic Execution Service

- BES-Factory **unsupported** attributes
 - ContainedResource -it is not clear what contained resource is.
 - TotalNumberOfcontainedResources - always 0.
 - ResourceName
 - OperatingSystem
 - CPUArchitecture
 - CPUCount
 - CPUSpeed
 - PhysicalMemory
 - VirtualMemory

Basic Execution Service

- BES-Activity attributes - **not supported**. It is not specified how those attributes are accessible.
 - Status - not supported
 - ActivityDocument - not supported
 - FactoryReference - not supported
- BES Optional Extensions – **not supported**
 - Idempotent Execution
 - Subscription to Notification Events
 - LifeTime Management

Basic Execution Service

- ARC activity states extensions
 - Splits Running state to provide data-staging and LRMS states
 - Splits Finished state to report Activity being deleted
- ARC interface extension
 - Added operation to request Activity status change

ChangeActivityStatus

ActivityIdentifier

OldStatus (optional)

NewStatus

ChangeActivityStatusResponse

NewStatus

Job Submission Description Language

- **Supported** elements
 - jSDL:Resources
 - jSDL:TotalCpuTime
 - jSDL:IndividualCpuTime
 - jSDL:TotalPhysicalMemory
 - jSDL:IndividualPhysicalMemory
 - jSDL:TotalDiskSpace
 - jSDL:IndividualDiskSpace
 - jSDL:TotalCpuCount
 - jSDL:IndividualCpuCount

Job Submission Description Language

- **Supported** elements
 - jsdl:DataStaging
 - jsdl:Source
 - jsdl:Target
 - jsdl:FileName
 - jsdl:URI

Job Submission Description Language

- **Supported** elements
 - jsdIPOSIX:Executable
 - jsdIPOSIX:Argument
 - jsdIPOSIX:CPUTimeLimit
 - jsdIPOSIX:WallTimeLimit
 - jsdIPOSIX:MemoryLimit
 - jsdIPOSIX:Input
 - jsdIPosix:Output
 - jsdIPOSIX:Error

Job Submission Description Language

- ARC **extension** elements
 - IsExecutable – if staged file is executable
 - GridTimeLimit – scaled to reference benchmarked system
 - RunTimeEnvironment – pre-installed application
 - AccessControl – GridACL permissions on activity
 - CandidateTarget/QueueName – local queue name
 - ProcessingStartTime – when to start activity
 - SessionFileTime – how long to keep finished activity
 - Notify – E-mail notifications about activity status changes
 - Reruns
 - RemoteLogging/URL – report activities to remote database
 - CredentialServer/URL – MyProxy service endpoint for credentials renew

A-REX Status

- A-REX is based on Grid Manager module of Classic ARC
 - Interface changed – still in development
 - Numerous enhancements in base code too
 - Few years in production
 - Currently running ~25000 CPU Grid
 - <http://www.nordugrid.org/monitor>
- Continuous enhancements in compatibility
- Documentation available at <http://www.nordugrid.org/documents/a-rex.pdf>

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