ARC Resource-coupled Execution Service (A-REX)

Aleksandr Konstantinov

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
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/BasicWSAdressing.
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

  \textit{ChangeActivityStatus}

  \texttt{ActivityIdentifier}

  \texttt{OldStatus} (optional)

  \texttt{NewStatus}

  \textit{ChangeActivityStatusResponse}

  \texttt{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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