.NET High Level API (NHILa)

Bridging the Gap between .NET and UNICORE
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Overview

- Motivation

- UNICORE Clients
  - Architecture

- NHiLA
  - WSRF.NET
  - Clients
  - Experiences

- Summary & Outlook
NHILA
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Motivation
Motivation

- **Status today:**
  - Hix4AGWS integrates a pull based approach for job distribution into UNICORE:
    - UNICORE provides a High Level API to develop Java clients
    - To connect .NET applications as actors we require .NET clients for UNICORE
### Motivation

- **Aim:**
  - Development of user interfaces with C# to use the UNICORE middleware with the pull based approach
  - Use the rich set of .NET capabilities
    - DataGridViews
    - LINQ
    - Integrated reporting tools
    - ...

![Diagram of Grid Middleware components including Task Client, TaskRepository, WFMS, Grid resources, and pull Jobs from GM connections with C# and Java Grid Resource icons.]
NHiLA
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UNICORE Clients
UNICORE Clients
General UNICORE Architecture

UCC Command Line Client
UCC Eclipse-based Client
HiLA Programming

Gateway Site 1
Gateway Site 2

UNICORE Atomic Services
OGSA*

UNICORE WS-RF Hosting Env.

XNJS - Site 1
XNJS - Site 2

UNICORE WS-RF Hosting Env.

Workflow Engine
Chemomentum

Service Orchestrator

Service Registry

CIS Info Service

XUUDB

XACML entity

Target System Interface 1
Target System Interface 2

Local RMS (Torque, LL, LSF)

External Storage

USpace
Storage
Storage
USpace

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Gateway Site 2
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Target System Interface 1
Local RMS (Torque, LL, LSF)
External Storage
USpace
Storage
Storage
USpace

Target System Interface 2
Local RMS (Torque, LL, LSF)
UNICORE Clients

- **UNICORE Commandline Client (UCC)**
  - Toolbox that allows users to access all features of the UNICORE service layer in a scripting environment

- **UNICORE Rich Client (URC)**
  - Eclipse based
  - Provides graphical view of the Grid to the users
  - Offers modeling tools to design complex scientific workflows

- **High Level API (HiLA)**
  - Develop specific user interfaces in Java
NHiLA
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.NET High Level API
NHiLA, .NET High Level API
Status Quo
NHiLA, .NET High Level API
WSRF.NET

- Evolved by the University of Virginia
- A set of software libraries, tools, and applications which implements WSRF and WS-Notification for .NET
- Build easily WSRF-compliant web services
- A platform for Grid-Computing on .NET
- Integrates Microsoft technologies, such as Web Service Enhancements
- SOAP engine for .NET, that is compliant to WSRF
- Starting point to develop the .NET High Level API (NHiLA)
NHiLA, .NET High Level API
Client Architecture

- TargetSystem-ServiceClient
- TargetSystem-FactoryService-Client
- JobClient
- FileTransfer-Client
- BaseWSRFClient
- StorageClient
- StorageFactory-Client
- RegistryClient
NHILA, .NET High Level API (1/5)

Clients

- BaseWSRFClient
  - Implements only the core communication functionality
  - Generic skeleton
  - Authentication handling with X509 certificates
  - Generated Stub integrates the whole logic for the communication and security
  - Certificate gets easily included in the WS-Client Stub
NHiLA, .NET High Level API (1/5)

Clients

- RegistryClient
  - Accessing a Registry or ServiceGroup service
  - Add registry entries and list available services
NHILA, .NET High Level API (2/5)

Clients

- **TargetSystemFactoryServiceClient**
  - Create a TargetSystemService client or list the target systems, which are available for the client

- **TargetSystemServiceClient**
  - Submit a job or get the current list of jobs on the target system
NHiLA, .NET High Level API (3/5)

Clients

- **StorageClient**
  - Access the StorageManagement service
  - Writing or Reading data from or to a given remote file
  - Copy, rename, send or search a file
  - Create a new directory

- **StorageFactoryClient**
  - Create a StorageClient or list the available storages
NHIL, .NET High Level API (4/5)

Clients

- **FileTransferClient**
  - Base Client for managing the File-Transfer
  - Two capabilities to transfer files
    - Random byte IO and streamable byte IO
    - Own clients for those two capabilities
NHILA, .NET High Level API (5/5)

**Clients**

- **JobClient**
  - Manage a job resource and access the job working directory
  - Start, abort, resume or hold a job
  - Wait until a job is finished
NHiLA, .NET High Level API Experiences

- Installation of UNICORE Servers was easy

- API Development with the delivered WSDLs and XML-Schemes was difficult
  - WSDLs had to be changed
  - A lot of any-Tags instead of specific Value-Types, when automatically generating stubs from WSDLs via wsdl.exe
  - Installation problem from WSRF.NET
    - Actual version (3.0.1) of WSRF.NET is not compatible with a higher versioned Framework than .NET 2.0

- C# has nearly the same capabilities like Java
  - The source-code is close to that from the Java UNICORE Atomic Services Clients
Summary & Outlook
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Summary:
• Extension to the UNICORE Client-Layer
• Development of C# Clients to use UNICORE middleware
• Hix4AGWS pull based approach with .NET possible

Outlook:
• Upgrade of WSRF.NET
  – Compatible to higher versioned Frameworks, LINQ can be used
• Graphical User Interface with C#
• Adaption to UNICORE Java HiLA
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Any questions?
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