

The DiVTB Platform: Some Experience Gained in the Application of UNICORE as Middleware in the "Mobility of Young Scientists" Project in Russia

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Outline

1. DiVTB system
 - Purpose
 - Architecture
2. Integration of external applications in the DiVTB system
3. Examples of applications

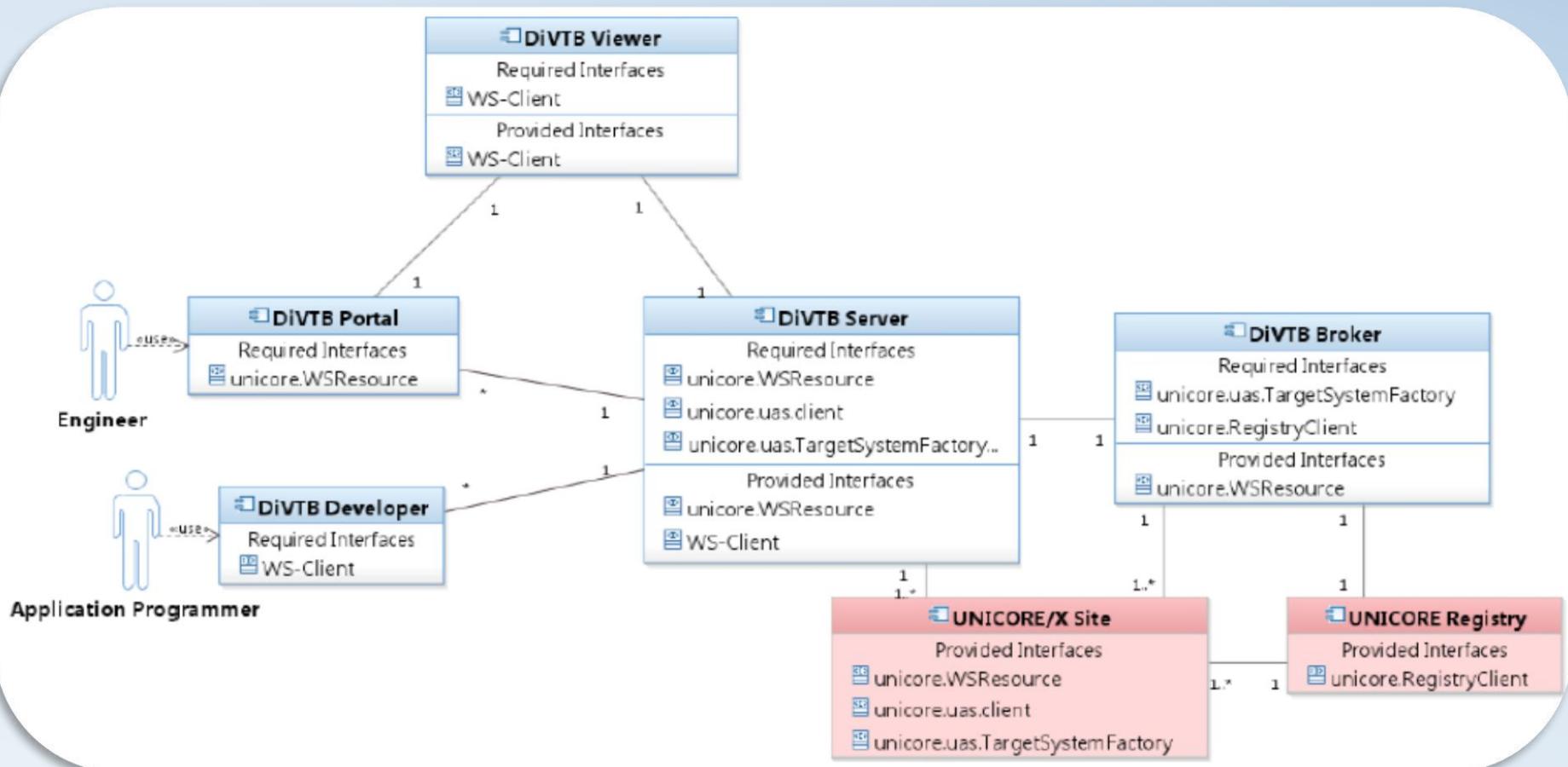


The DiVTB system

Purpose of the DiVTB system

- DiVTB (Distributed Virtual Test Bed) is a software system that provides the design and operation of distributed virtual test beds
- DiVTB provides a problem-oriented approach to specific classes of tasks in engineering design through resources provided by grid computing environments

Architecture of the DiVTB system





Integration of external applications in the DiVTB system

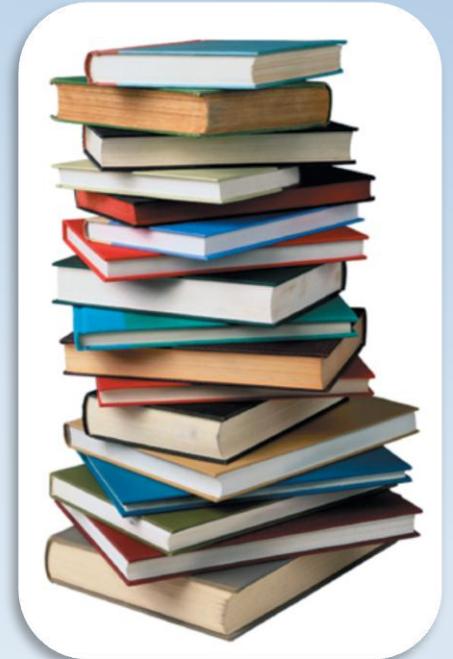
"Mobility of Young Scientists" Project

- The Federal Target Programme, entitled as "Scientific and Scientific-Pedagogical Personnel of the Innovative Russia" for the years 2009-2013
- "Technology of Creating Task-Oriented Services in Distributed Computing Environments“ as part of the above Programme



Materials for the participants

- A quick guide for the DiVTB system
- A virtual machine
- A guide for the virtual machine
- Examples of the project integration
- A visualiser for test beds



Virtual Machine of the DiVTB system

- Oracle VM Virtual Box
- OpenSUSE
- UNICORE-SERVERS
- UCC



Integration methodology of external applications

1. Describing an application in simpleidb
2. Creating a problem-oriented shell for the DiVTB Portal component to remotely trigger an external application as a grid service

Step 1. Describing an application in simpleidb

```
<idb:IDBApplication>
  <idb:ApplicationName>Pow</idb:ApplicationName>
  <idb:ApplicationVersion>1.0</idb:ApplicationVersion>
  <jsdl:POSIXApplication xmlns:jsdl="http://schemas.ggf.org/jsdl/
                            2005/11/jsdl-posix">
    <jsdl:Executable>/bin/pow</jsdl:Executable>
    <jsdl:Argument>$FIRST_PARAMETER</jsdl:Argument>
    <jsdl:Argument>$SECOND_PARAMETER</jsdl:Argument>
  </jsdl:POSIXApplication>
</idb:IDBApplication>
```

Step 2. Creating a problem-oriented shell

```
<?xml version="1.0" encoding="utf-8"?>
<problemCaebean xmlns="http://caeserver.caebeans.org" name="Concept_IH" author="Mr.Smith"
version="1.0" caebeanId="{pow-test}">
  <categories>
    <category name="first_pair" data="first_pair_data">
      <parameter name="first_parameter" type="Float" visible="true">
        <text data="first_parameter_T" />
        <units data="first_parameter_U" />
        <comment data="first_parameter_C" />
        <enums />
        <default>2</default>
        <value></value>
      </parameter>
      <parameter name="second_parameter" type="Float" visible="true">...</parameter>
    </category>
  <resources>
    <language xml:lang="ru">
      <data name="first_pair_data">First pair</data>
      <data name="first_parameter_T">X</data>
      <data name="first_parameter_U" />
      <data name="first_parameter_C">The X number</data>
      <data name="second_parameter_T">Y</data>
      <data name="second_parameter_U" />
      <data name="second_parameter_C">The Y number</data>
    </language>
  </resources>
</problemCaebean>
```

Visualisation of a test bed with the DiVTB Portal Test Bed Viewer

pow-test.xml

testbed.xsl

html-code

The diagram illustrates the transformation process. On the left, two windows show the input files: 'pow-test.xml' and 'testbed.xsl'. An arrow points from these inputs to the right, where a window displays the resulting 'html-code' (the generated HTML page). The 'html-code' window shows a configuration interface for a test bed, with sections for 'Идентификационные параметры задачи' (Identification parameters of the task) and 'Необходимые ресурсы' (Required resources), along with parameter input fields and a 'Submit' button.

pow-test.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<xsl:stylesheet type="text/xsl" href="testbed.xsl">
<problemCaebean name="Concept_IH" author="Mr. Smith" version="1.0" caebainId="(pow-test)">
<categories>
  <category name="first_pair" data="first_pair_data" type="First" visible="true">
    <text data="first_parameter_I" />
    <units data="number_U" />
    <comment data="number_U_parameter_C" />
  </category>
  <category name="second_pair" data="second_parameter_I" />
    <text data="second_parameter_I" />
    <units data="number_U" />
    <comment data="second_parameter_C" />
  </category>
</categories>
<parameters>
  <parameter name="first_parameter" type="First" value="10" />
  <parameter name="second_parameter" type="Second" value="25" />
</parameters>
<resources>
  <category name="first_parameter_C" data="first_parameter_C" type="First" visible="true">
    <text data="first_parameter_I" />
    <units data="number_U" />
    <comment data="number_U_parameter_C" />
  </category>
  <category name="second_parameter_C" data="second_parameter_C" type="Second" value="25" />
  <category name="language" data="language" type="Language" value="English" />
</resources>
</problemCaebean>
```

testbed.xsl

```
<xsl:stylesheet version="1.0">
<xsl:output method="html" indent="yes" version="4.0"/>
<xsl:template match="/">
  <!--
    <xsl:text disable-output-escaping="yes"><!DOCTYPE html></xsl:text>
  -->
  <html lang="en">
    <head>
      <title>CAEBeans Portal / Испытательные стенд / Предварительный просмотр</title>
      <meta charset="UTF-8" />
      <link rel="stylesheet" href="css/style.css" type="text/css" media="screen" />
    </head>
    <body>
      <div class="top-container">
        <div class="content">
          <div class="user-menu">
            <ul>
              <li>
                <a href="#" onClick="set_language('GB')">
                  
                </a>
              </li>
              <li class="active">
                <a href="#">
                  
                </a>
              </li>
            <ul>
              <form id="language_form" name="language_form" action="" method="post" style="display: none;">
                <input id="selected_language" name="language" type="hidden" value="" />
              </form>
            <li>
              <li class="active">
                <a href="#">
                  Заполните, <b>Пользователь</b>!
                </a>
              </li>
            </ul>
          </div>
        </div>
      </div>
    </body>
  </html>
</xsl:template>

```

The screenshot shows the DiVTB Portal Test Bed Viewer interface. It features a header with the portal logo and navigation links. Below the header, there are sections for 'Идентификационные параметры задачи' (Identification parameters of the task) and 'Необходимые ресурсы' (Required resources). The 'Идентификационные параметры задачи' section includes fields for the task name ('Concept_IH') and its description ('Задача для отображения в менеджере задач'). The 'Необходимые ресурсы' section includes fields for the number of cores ('1 шт') and memory ('256 МБ'). At the bottom, there are sections for 'Первая пара параметров:' (First pair of parameters) and 'Вторая пара параметров:' (Second pair of parameters), each with numerical input fields. A 'Submit' button is located at the bottom right.

DiVTB Portal

Испытательный стенд: Concept_IH

Идентификационные параметры задачи:

Название задачи
Название задачи, которое будет отображаться в менеджере задач
Значение по умолчанию: Concept_IH

Необходимые ресурсы:

Количество ядер
Необходимое количество процессорных ядер для постановки задачи
Значение по умолчанию: 1

Объем ОЗУ
Объем оперативной памяти, необходимый для постановки задачи
Значение по умолчанию: 256

Первая пара параметров:

Целое число
Будет возведено в степень
Значение по умолчанию: 4

Целое число
Задает степень для первого числа
Значение по умолчанию: 10

Вторая пара параметров:

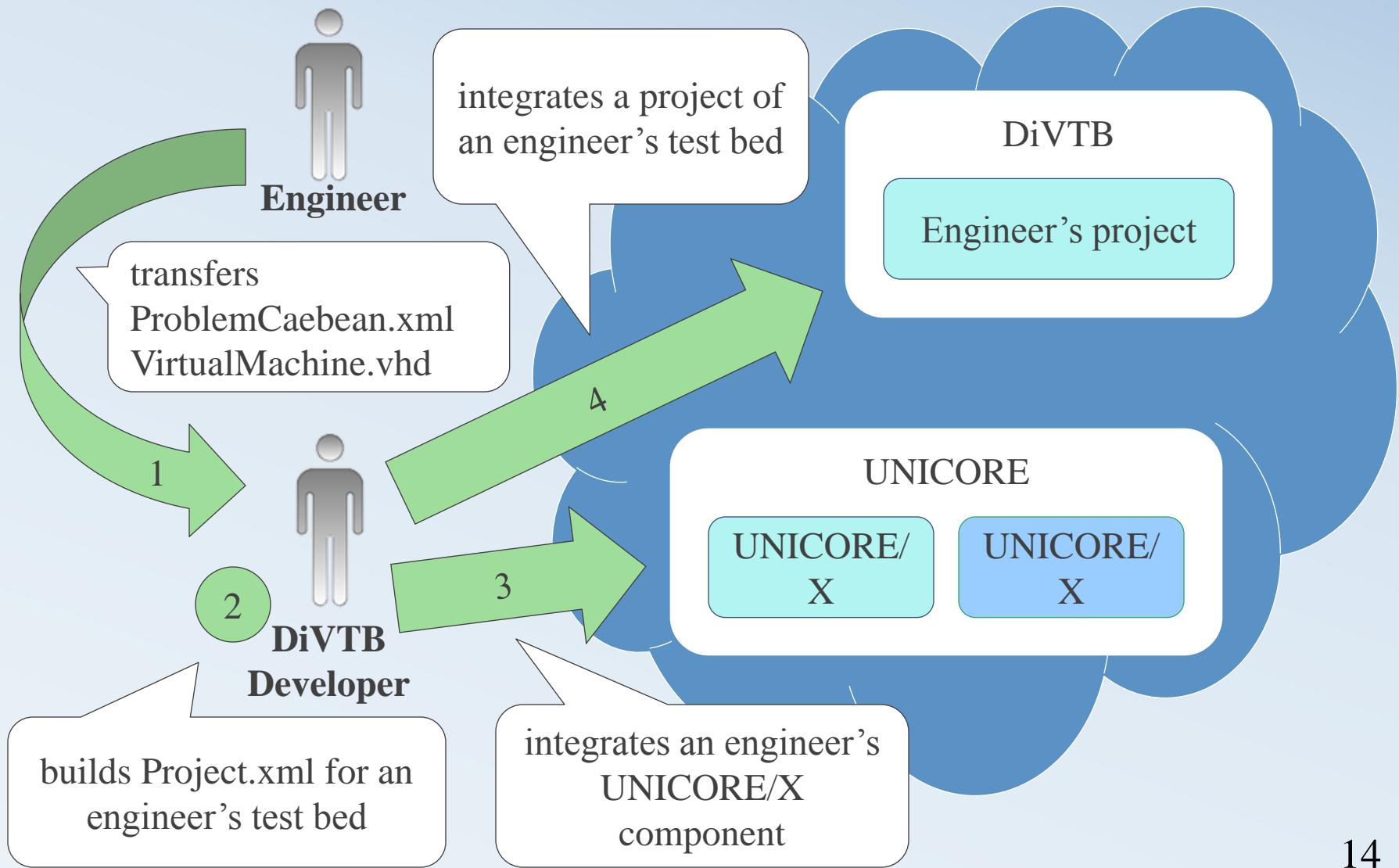
Целое число
Будет возведено в степень
Значение по умолчанию: 10

Целое число
Задает степень для первого числа
Значение по умолчанию: 2

Submit

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Final integration

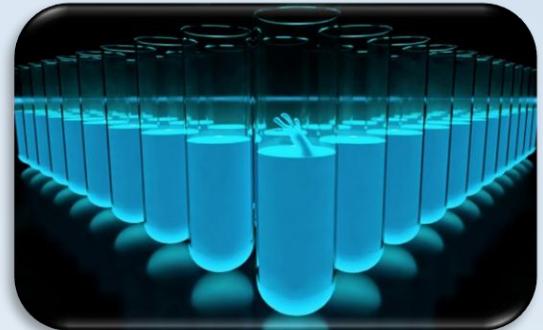




Examples of applications

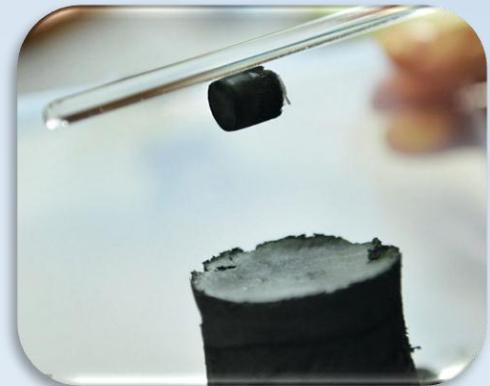
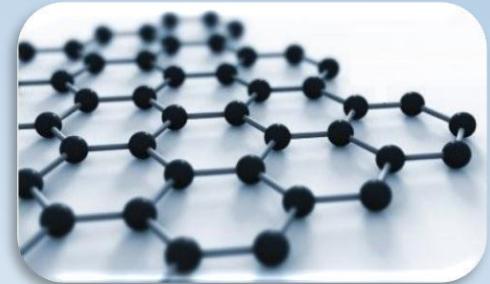
Simulation of a chemical reaction of a metal complex catalysis

- Chemical reaction of a metal complex catalysis: a hydroalumination of olefins
- Calculation of a direct problem and checking the law of conservation
- Simulation of an induction period of the reaction for predicting the period's behaviour under different input data



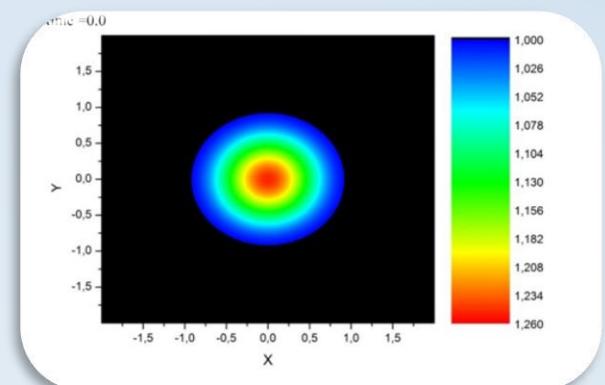
Simulation of magnetic properties of nanomaterials

- Modelling of magnetic nanofilms
- Calculation of magnetic properties
- Solving of systems of nonlinear transcendental equations with many unknowns
- Writing of the application in the PYTHON programming language



Simulation of continuous media mechanics

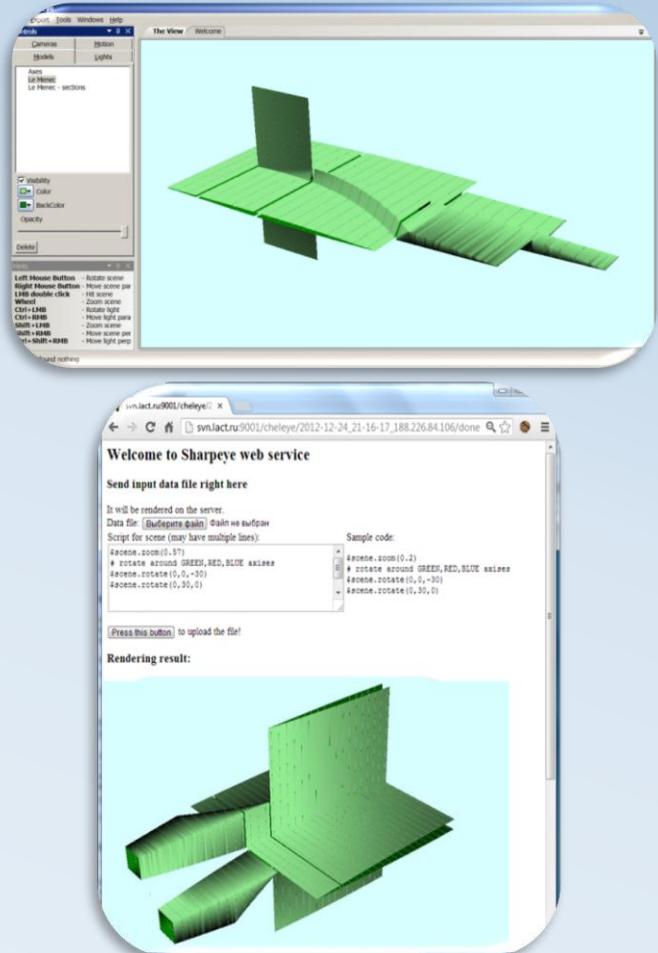
- A model of two-dimensional acoustics
 - a parametrisable constant density
 - a parametrisable constant speed of sound
 - an initial exciting constant source of pressure
- Homogeneous boundary conditions of the first order
- Godunov's method



I.M. Kulikov, an employee of the Institute of Computational Mathematics and Mathematical Geophysics, the Siberian Branch of the Russian Academy of Sciences

Remote visualisation service for problem solving

- SharpEye as a scientific visualisation system
- REST-server for SharpEye
- Two types of interfaces:
graphic
programmatic



P.A. Vasev, an employee of the Institute of Mathematics and Mechanics,
the Ural Branch of the Russian Academy of Sciences

Results Yielded by the "Mobility of Young Scientists" Project

- Development of a technology for creating problem-oriented services in a distributed computing environment
- Creating of a methodology for the integration of problem-oriented applications
- Elaboration of a set of distributed virtual test beds for the solution of problems in various fields of knowledge

