«CosmOdis»
Distributed Computing Systems as Project Learning Environment for "Generation NET"

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2017
Additional education for pupils at 9-11 courses
Main direction of study: distributed computing technologies, HPC systems
Lectures and practical trainings for 2-3 years
Group work in project teams

1 stage: school at Podolsk at Moscow region
2 stage: schools at all regions of Russia
3 stage: federal education program for all schools
Current situation and trends

Education

- Children “Digital-native” and “Generation NET”
- Active requests of children and parents
- Practice-oriented education (projects, teams)
- Individualization
- Soft-skills of the 21st century, orientation to the development of personality abilities

Distributed computing

- Popularization of volunteer distributed computing
- Study and involvement in real scientific projects
- Complex training for the distributed computing knowledge domain (school-institute-science)
- Utilization of idle time of educational computers
- Real help to the scientific organizations
Problems - the potential for convergence

**Education**

- demand for practical tasks for projects
- "educational inbreeding" - the academic community and business does not participate in projects for children
- shortage of mentors, experts
- there is no content base for project management (recommendations, practices, examples)

**Distributed computing**

- shortage of volunteers
- need for tools to involve and retain volunteers
- popularization of DCS
- shortage of educational content for the DCS (recommendations, video lessons, webinars, presentations, a bank of implemented projects)
Number of active volunteers in Russian Federation and in Czech Republic is same
Attraction of students to volunteer DCS projects

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</thead>
<tbody>
<tr>
<td>SETI@home</td>
<td>the search for intelligent extraterrestrial civilizations made possible involving a significant number of volunteers in the project</td>
<td>1,4 million people</td>
<td>560 Teraflops</td>
<td>not found</td>
</tr>
<tr>
<td>Enstein@home</td>
<td>the search of extraterrestrial objects, including pulsars</td>
<td>355 367</td>
<td>2 471 906</td>
<td>not found</td>
</tr>
<tr>
<td>Rosetta@home</td>
<td>solving the problem of computing the tertiary structure of proteins from their amino acid sequences</td>
<td>340 000</td>
<td>259 000</td>
<td>not found</td>
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<td>Leiden Classical</td>
<td>DCS technology for the solution of applied problems simultaneously learning the DCS principles and technologies</td>
<td>18 000</td>
<td>18 000</td>
<td>students</td>
</tr>
<tr>
<td>World Community Grid (WCG)</td>
<td>attract high-tech industries and high-tech companies to distributed computing.</td>
<td>719 075</td>
<td>3 237 238</td>
<td>not found</td>
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</tbody>
</table>
Proposed solution

Objectives of education

Project platform «CosmOdis»

Objectives of DCS

sustainable developing children's and adult expert community

educational and popular-science content (including DCS)

offline and online events
**CosmOdis side**

**Project components:**
- Production
  - relevance
  - novelty
  - Expected results
  - practical significance
  - limitations and assumptions
- Research
- Engineering and Design*
- Socio-economic
- Organizational
- Marketing

**Real result:**
- Analytical report
- Technical project
- Model of the device prototype
- Software
- Event
- Work, etc.

**Real Convergent:**
- Mathematics
- Physics
- Chemistry
- Biology
- Technology
- Computer science
- Foreign languages
- Geography
- Russian language and literature …
The private umbrella project for CosmOdis project

- Opportunity to make several subprojects
- Only for CosmOdis project
- At first stage only for pupils, tutors and experts
- Main goal: education

CosmOdis@home

Subprojects:
- Space Odyssey
- Web
- Meteo
- Crypto
- …
# Examples of ambitious goals

<table>
<thead>
<tr>
<th>Project title</th>
<th>Ambitious goal</th>
<th>Content</th>
<th>Status (2017)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CosmOdis / Space Odyssey</td>
<td>The exploration of other planets of the Solar system</td>
<td>The task of finding potentially habitable planets, calculation, simulation flight, development of residential units etc.</td>
<td>Launched</td>
</tr>
<tr>
<td>CosmOdis / Web</td>
<td>The solution to the problems of traffic jams of major cities (e.g., Moscow)</td>
<td>Students participate in the creation and consists of different network topology traffic counts.</td>
<td>Development of project assignments</td>
</tr>
<tr>
<td>CosmOdis / Meteo</td>
<td>Accurate weather forecast for their home / neighborhood / city / region</td>
<td>Calculation of the adjusted forecast of the weather of a certain territory based on the compilation of satellite photos obtained from local centers of remote sensing, the official weather measurements in local school weather station.</td>
<td>Development of project assignments</td>
</tr>
<tr>
<td>CosmOdis / Cripto</td>
<td>Decryption and cryptography</td>
<td>Compilation of Latin squares with certain properties</td>
<td>planning</td>
</tr>
</tbody>
</table>
Project in the system «child-expert»
Features of Cosmodis@home

Decomposition of the task: Standard for BOINC projects “bag-of-task” decomposition. The level of decomposition is determined by the task developers.

Technological platform: BOINC

Involving pupils: a system for motivating children

- personal portfolio of the participant
- professional growth
- consultations from leading scientists
- prizes and certificates to participant
- additional points to the Unified State Exam at the victory at the festival
The results (2016 - 2017)

6 regions, 700 participants, 70 experts, 155 implemented projects
Festivals «CosmOdis»

Moscow, Ugra, Kaliningrad region, Mordovia, Moscow region, Leningrad region, Ossetia ...

Correspondence (qualifying stage) – qualification
Exhibition (expert protection) - scientific and technical aspects
Final (public protection) - business aspects
Purpose: to combine mechanisms of control and wireless access to technological systems (instruments, tools and installations for IoT)

The result: an Internet platform for things was developed and put on the market

Project Manager: Samoylov Nikita, Course 11
**Purpose:** to develop a 3D model of a space station for the location of a ship

**Result:** The 3D model of space station modules on Mars was designed and added with markers and video objects

**Project Manager:** Valery A. Snigirev, Course 8
Vegetaria as part of the closed ecological system of a residential unit

**Project Manager:** Soyka Daniil, Course 6

**Purpose:** to create a vegetarian model as part of a closed ecological system of a residential unit

**The result:** the created model of vegetarians is a factor in improving the quality of life
Purpose: to create an operational model for a carbon dioxide absorption plant

Result: the active model of algobioglobotitel carbon dioxide

Project Manager: Semizorova Appolinary, Course 10
On the road to success in the network century!

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