Institute of Information and Communication Technologies (IICT – BAS)

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1. Strategic targets and mission

Strategic targets:

Sustainable development of the institute as a national leader in the information and communication technologies, with internationally visible and recognized results.

Mission:

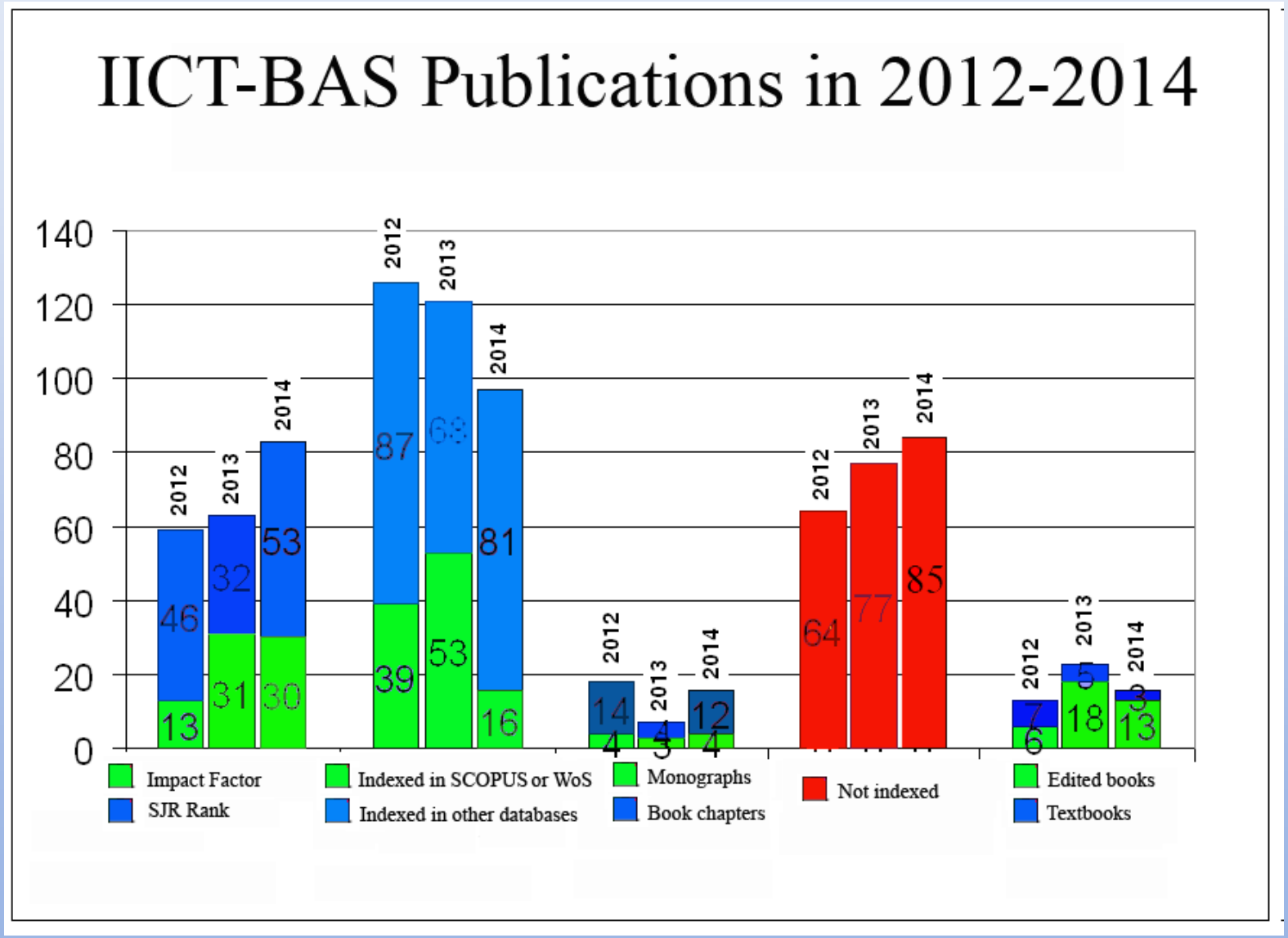
To perform basic and applied research in the fields of computer science and information and communication technologies, as well as to develop interdisciplinary innovations.

2. Structure of the R&D activities

The research and development activities of IICT during 2014 are performed into the framework of the following main projects:

- 15 funded by the budget subsidiary
- 10 supported by the Bulgarian Science Fund (BSF)
- 16 funded by the Operational Programs: 13 by OP „Development of the Competitiveness of the Bulgarian Economics“ and 3 by OP „Human Resources Development”
- 20 international projects: 18 funded by EC
- 11 R&D contracts directly with industrial enterprise

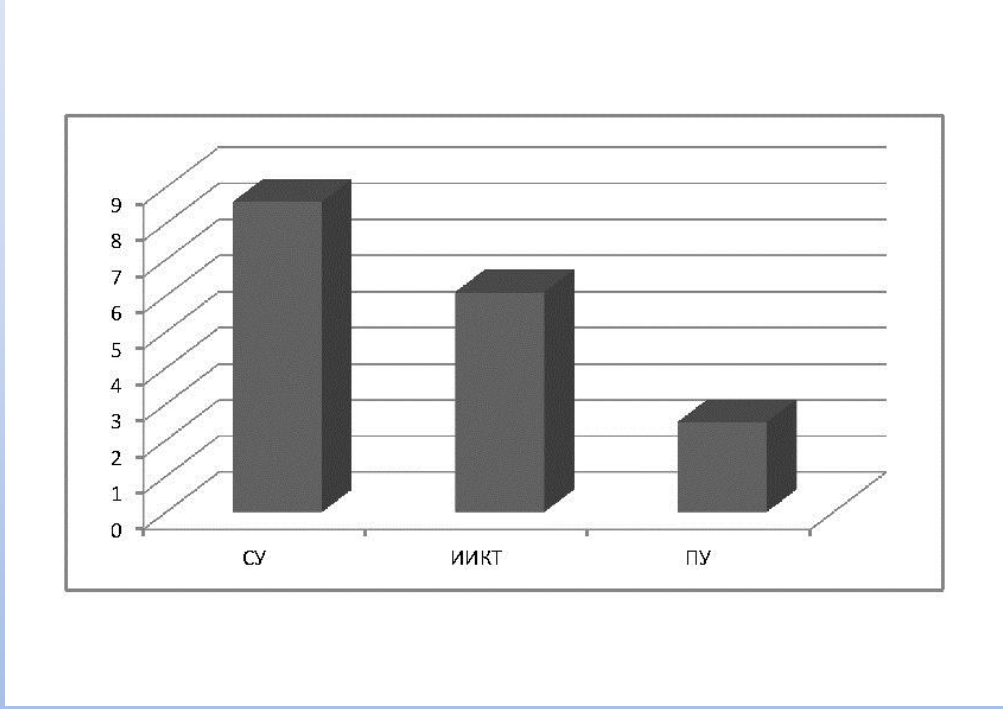
Scientific Publications



3. Projects: Bulgarian NSF & FP7

The successful participation of IICT in the EC Framework Programs has a strategic role for the sustainable development of the human potential and research infrastructure.

During 2014, the research teams from IICT ИИКТ have worked on 20 international projects, including18 EC projects.



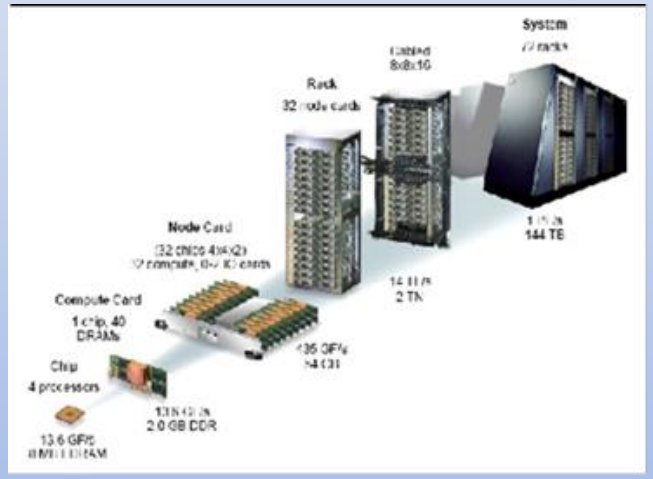
Funding in MEUR for the whole FP7 of most successful Bulgarian participants:

Sofia University – 8.6, IICT – 6.1, and Plovdiv University – 2.5

CoE on Supercomputing Applications

Consortium: IICT – BAS (coordinator), SU, TU – Sofia, MU – Sofia, IM – BAS, NIGGG - BAS

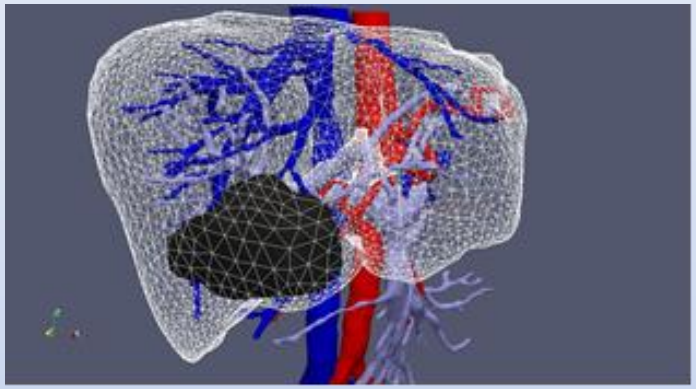
Infrastructure: supercomputer IBM Blue Gene/P at NSCC, HPC Cluster at IICT – BAS

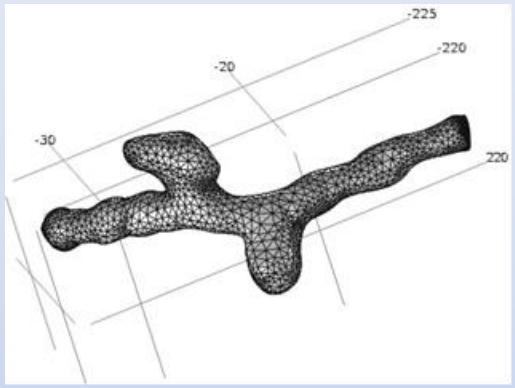


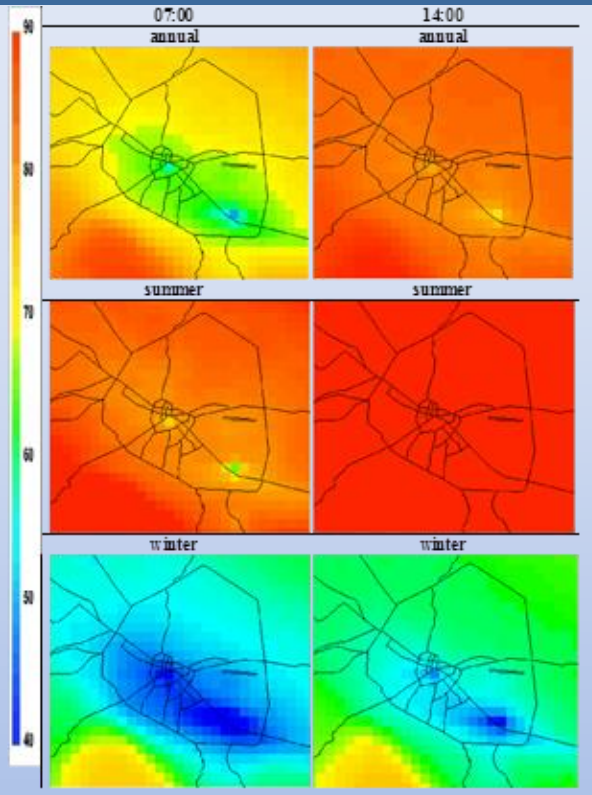
Target: to create a critical mass of highly qualified scientists

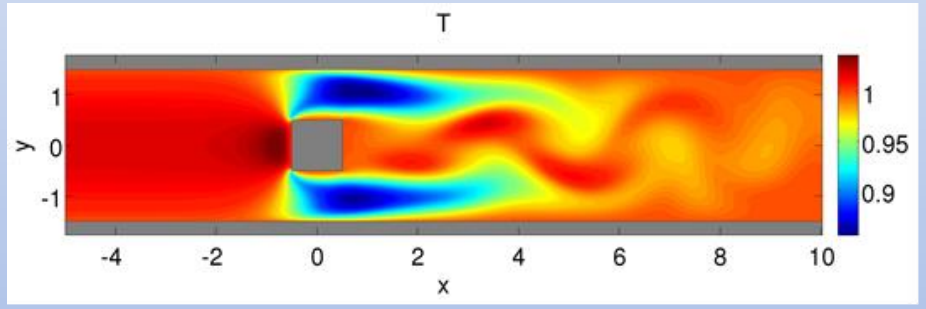
Core team: more than 80 participants, 56% of them - PhD students and young researchers

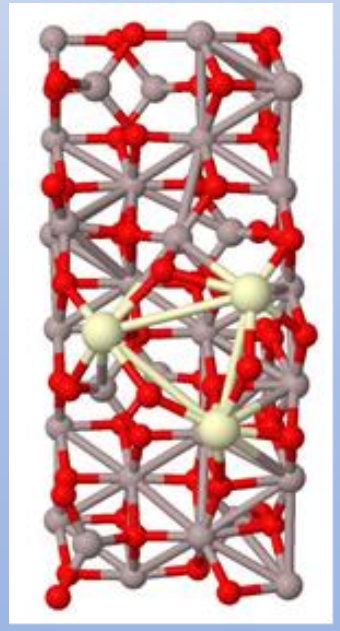
SuperCA++ Simulations

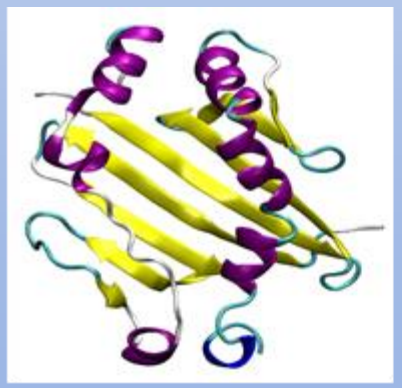


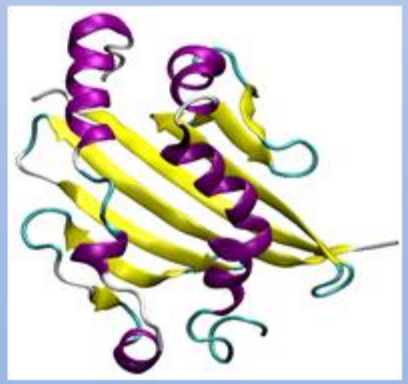


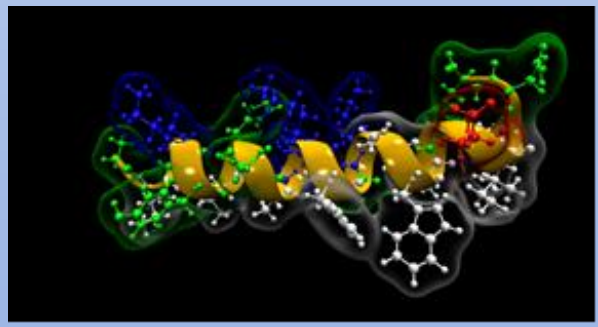






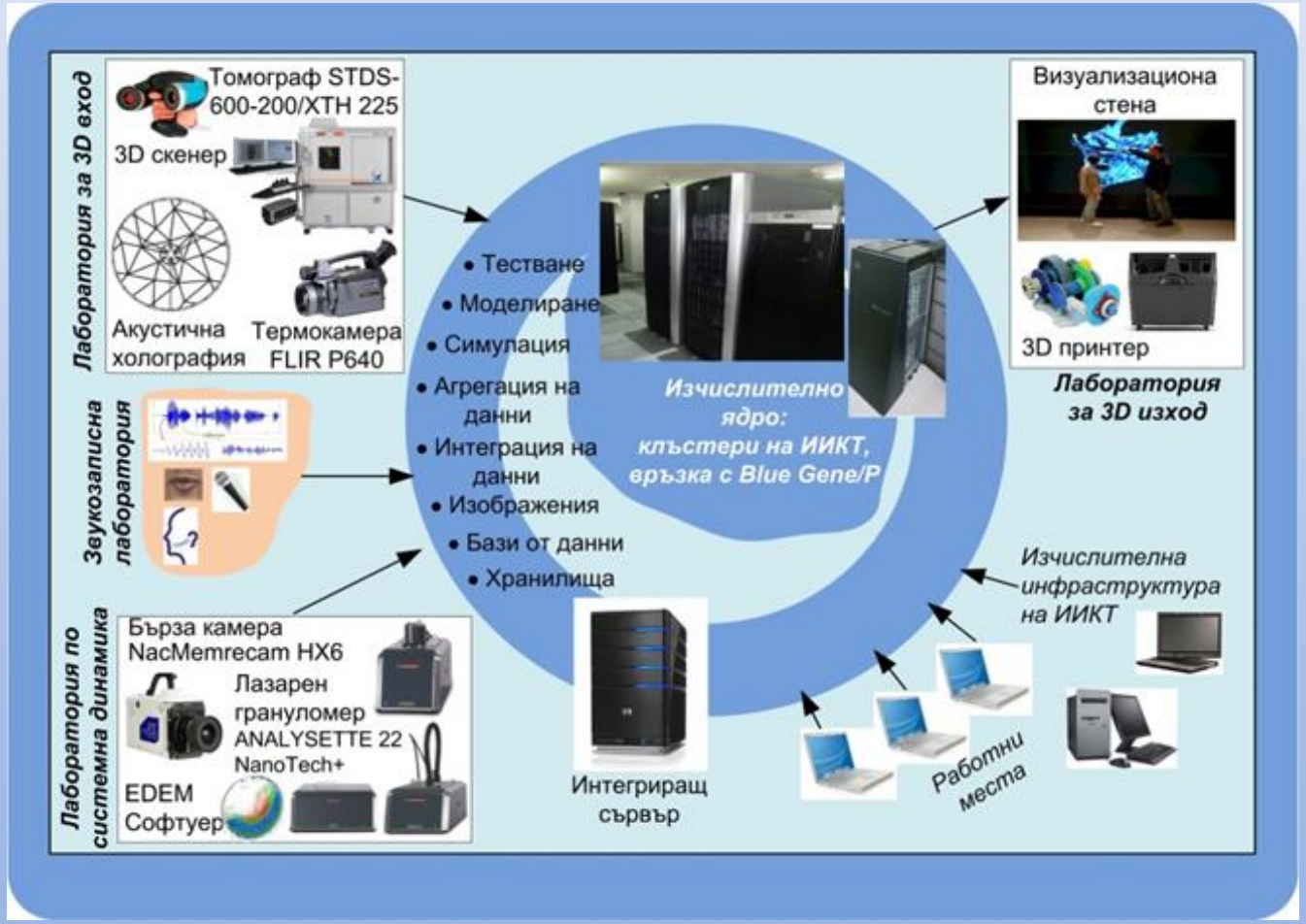






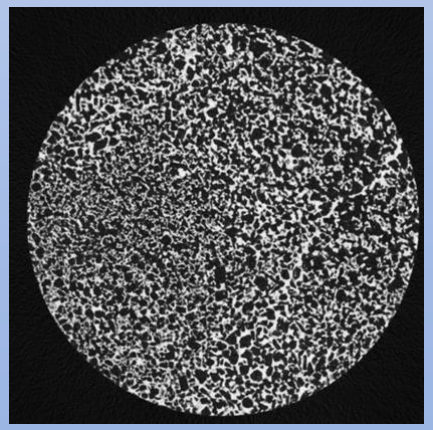
Advanced Computing for Innovations: AComIn, FP7-REGPOT

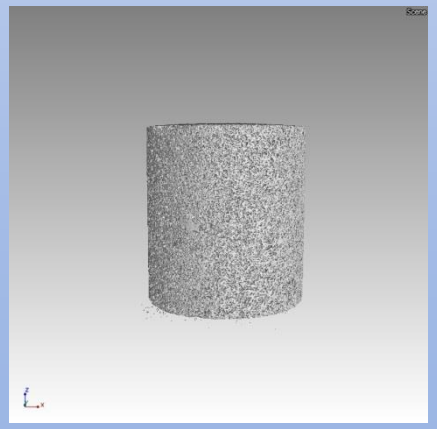
Major Objectives: (i) Strengthening the human potential, (ii) Setting up a Smart Lab, (iii) Organization and training of user communities.

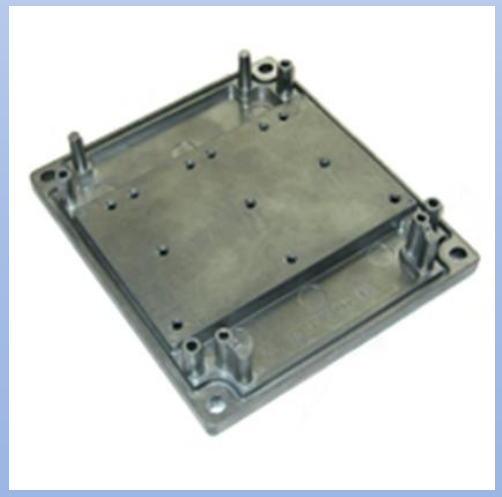


Industrial Tomography

- XT H 225: industrial computed tomography for microstructure analysis.
- Resolution: 1900 x 1500 pixels in cross section with X-ray spot of 3 μm.
- Pilot application: Distribution of pores in aluminum detail, produced by high pressure vacuum casting. Part of this detail works also as radiator and pores are to be avoided, if possible.

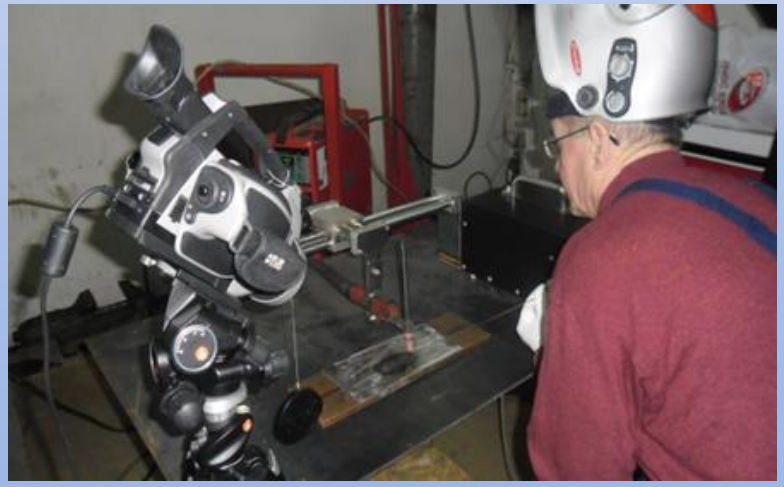


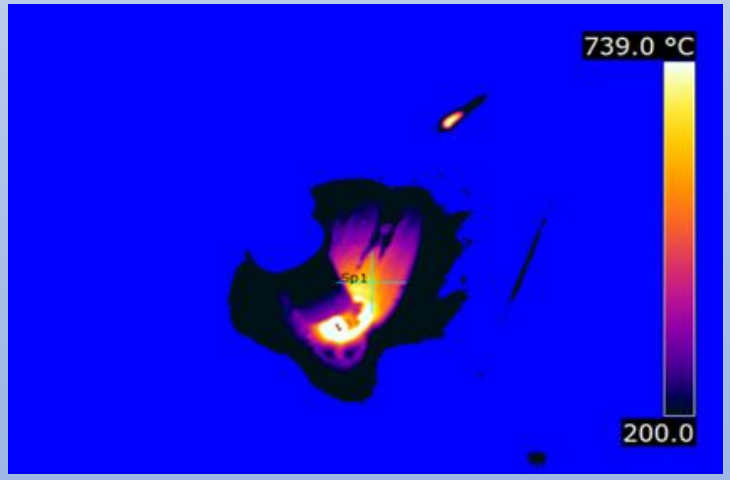




Infrared Thermocamera

- FLIR P640: digital thermographic measurement between -40^0 C and +2000^0 C wit detector matrix 640 x 480 pixels.
- Pilot application: thermographic study of process of nanowelding.





3D Prototyping and visualization

Pilot Application in collaboration with Prof. V. Cantoni:

- Exposition of cultural heritage in the Castle of Pavia, a satellite event of Expo 2015 in Milan.
- Battle for Pavia: 17th century goblin (left) and 3D printed art reconstruction (right).

4. Projects: Horizon 2020

First successful proposals:

- **"Centre of Excellence for Mathematical Modeling and Advanced Computing" (MMAC); Coordinator: IICT-BAS; Consortium – 3 partners; H2020-WIDESPREAD-2014-1**
- "Supercomputing Expertise for SmAll and Medium Enterprise Network" (SESAME-NET), Coordinator : High Performance Computing Wales, UK; Consortium – 10 partners; H2020-EINFRA-2014-2
- "Engaging the EGI Community towards an Open Science Commons" (EGI-Engage); Coordinator: EGI.eu, Nederland; Consortium - 43 partners; H2020-EINFRA-2014-2
- "Transnational Cooperation among ICT NCPs" (Idealist 2018); Coordinator: MATIMOP, Israeli Industry Center for Research & Development; Consortium – 32 partners; H2020-ICT-2014-1

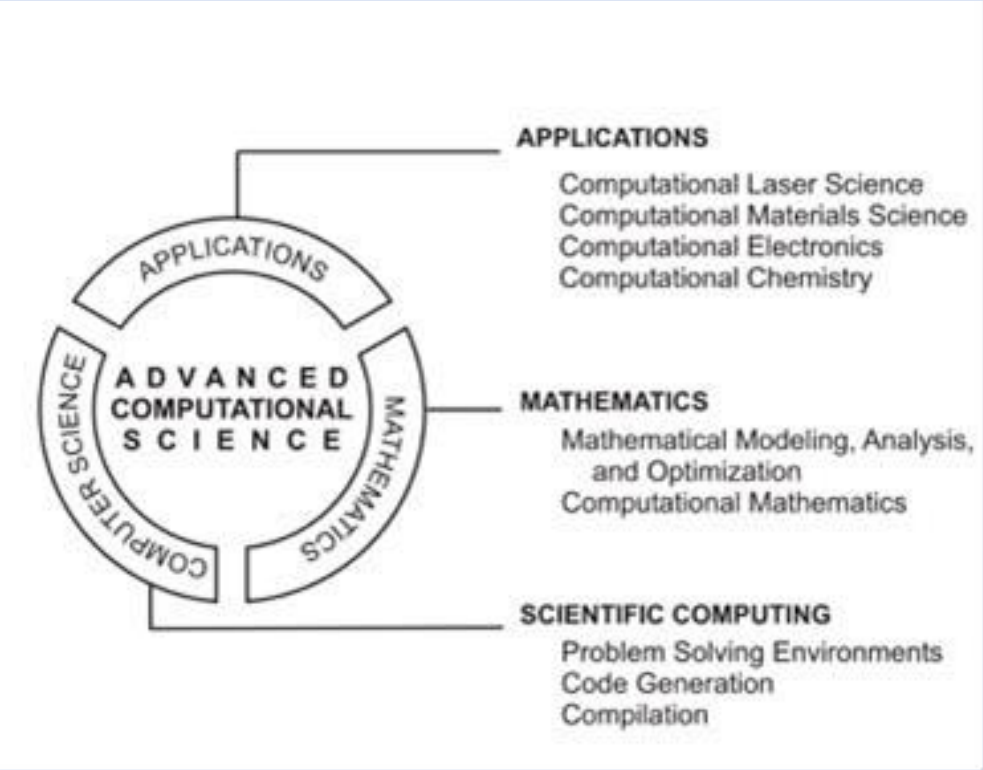
Horizon 2020 Teaming CoE

CoE for Mathematical Modelling and Advanced Computing in Science and Engineering - MMAC

Coordinator: IICT - BAS

Consortium:

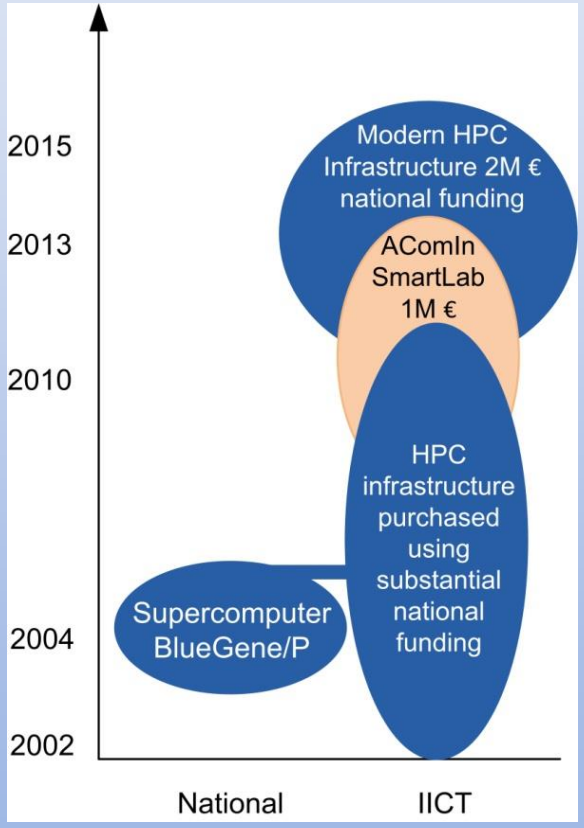
1. **Institute of Information and Communication Technologies, Bulgarian Academy of Sciences (IICT – BAS)**
2. **Institute of Mathematics and Informatics, Bulgarian Academy of Sciences (IMI – BAS)**
3. **Vienna University of Technology (VUT)**
   - **3.1. Institute of Analysis and Scientific Computing**
   - **3.2. Institute of Mathematical Methods in Economics**
   - **3.3. Institute of Microelectronics**



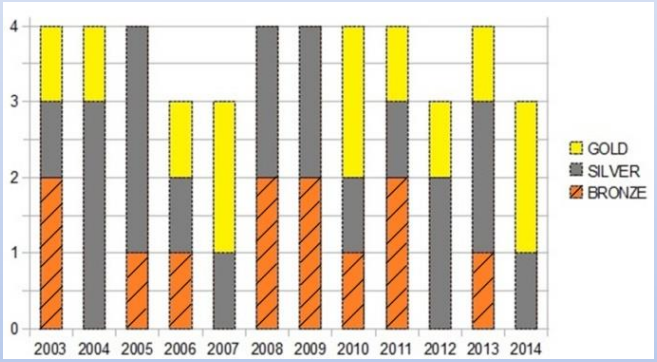
Synergy between mathematics, computer science and applications

Synergy between IICT & IMI

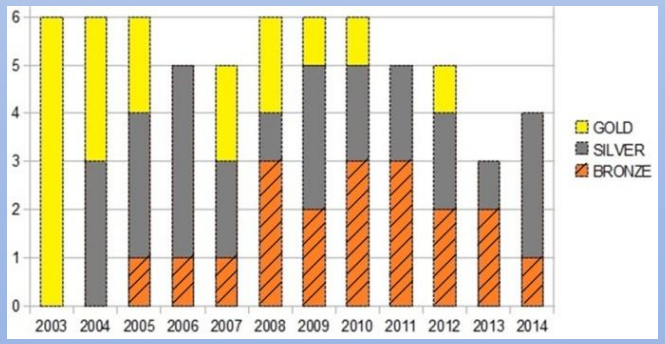
IICT Advanced HPC Infrastructure, 2002-2015	**IMI education and training system** for talented young mathematicians, recent results



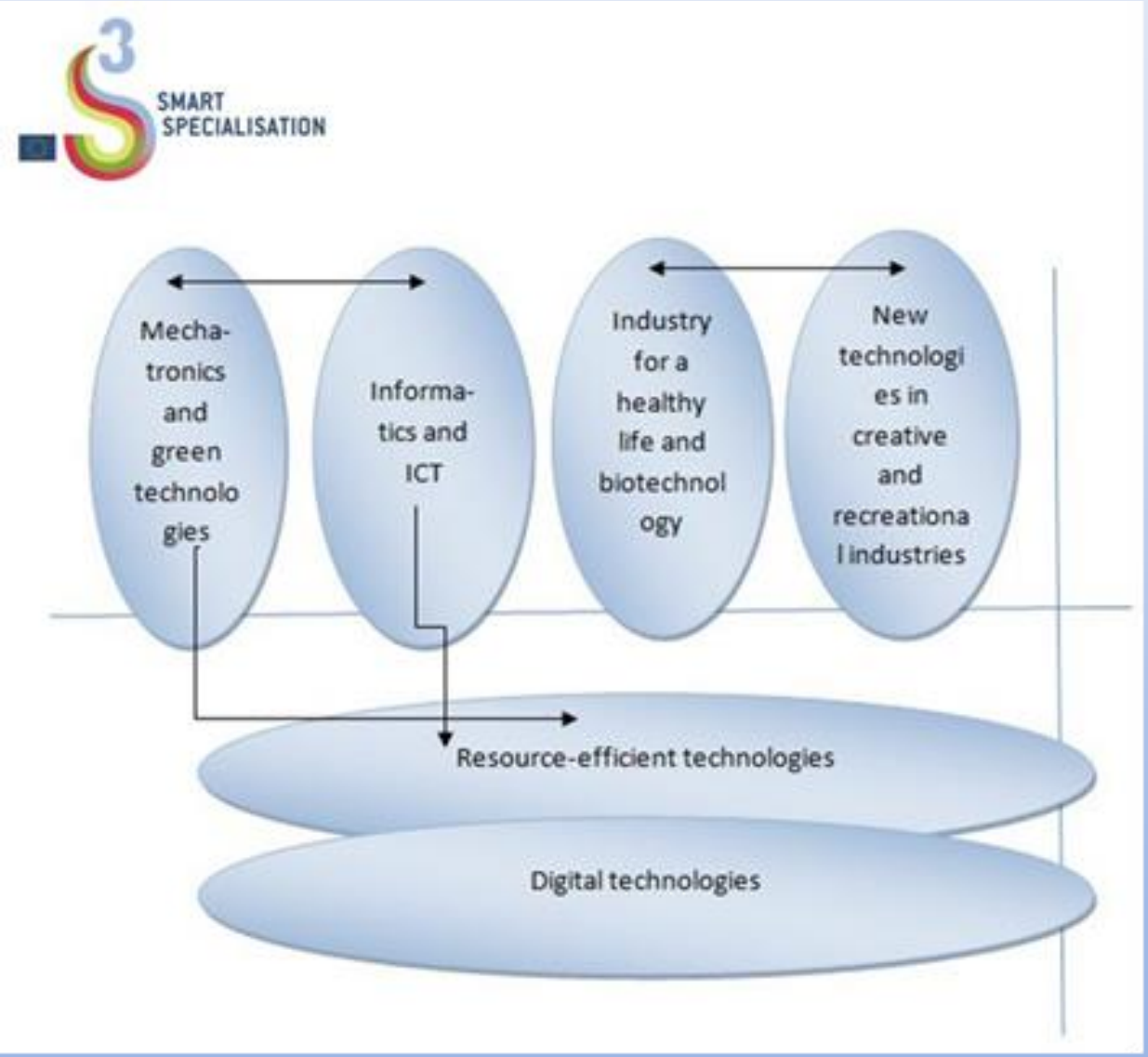
Performance (number of Medals) of the Bulgarian National Team in the Int. Olympiads in Informatics:



Performance (number of Medals) of the Bulgarian National Team in the Int. Olympiads in Mathematics:



Harmonization with the Bulgarian Innovation Strategy for Smart Specialisation

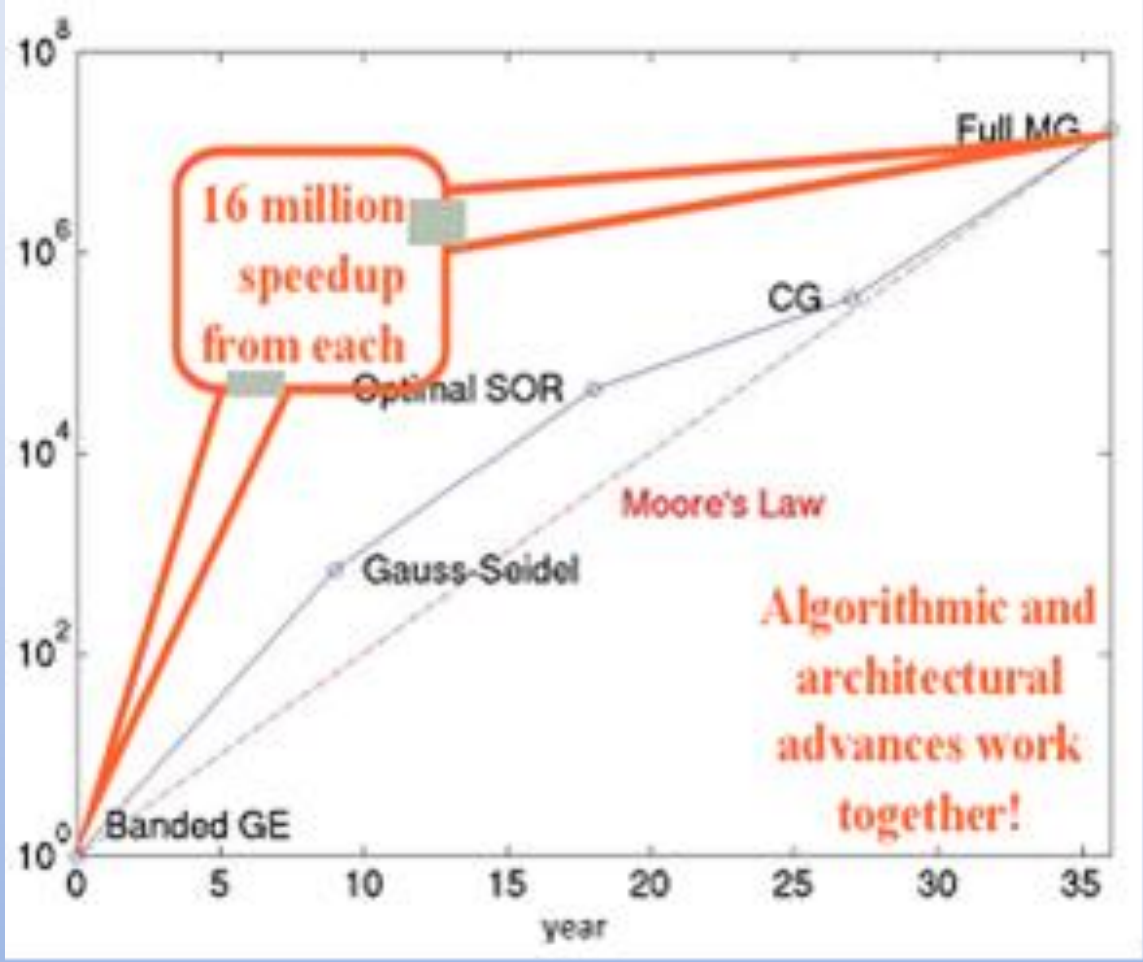


Advanced research infrastructure

- The new CoE is concerned with the substantial upgrade of the existing HPC infrastructure of IICT using national funding.
- The new HPC system will be aligned with the concepts of ETP4HPC: European Technology Platform for High-Performance Computing – Achieving HPC leadership in Europe.
- The performance of the system will position Bulgaria as an HPC leader in South-Eastern Europe.
- The new HPC cluster will consist of 150 computational servers HP SL250s Gen8, equipped with two Intel Xeon E5-2650v2 CPUs and two Intel Xeon Phi 7120P coprocessors, 64GB RAM, two 500 GB hard drives, interconnected with non-blocking FDR Infiniband running at 56 Gbps line speed.

  The peak performance of the system is estimated at 410.82 Teraflops in double precision.

Synergy between mathematical modelling and RI



5. Challenges towards sustainable development

Sustainable development and maintenance of the research infrastructure:

- Funding of the **National Roadmap for research infrastructure**: IICT is scientific and technical coordinator in two of them.
- There are restrictions in the eligibility to spend **project money for maintenance or up-grade** of existing equipment, e.g., bought trough some other project.
- Collaborations with **Sofia Tech Park**, based on its stronger administrative and financial potential: a) A new smaller (satellite) HPC cluster is planned. It could be specialized in more SMEs oriented applications and services, and will be welcome if apply to join the Consortium for Supercomputing applications (co-founded and coordinated by IICT). b) The users of the planned lab for 3D printing could be directed (for further real life applications) to the established at IICT more complex Center for 3D digitalization, prototyping and visualization.

Further development of the project funding:

- Strengthening the synergy between different programs/instruments **Project Funding.**
- Following the best European practices in the procedures of Operational Programs: **Clear definitions of requirements, evaluation criteria, reviewing procedures and provided ESR.**
- **Prioritized sustainable national support for the** H2020 Teaming Centers of Excellence.
- The **low institutional RTD funding** can't be compensated by instruments of external projects.

Thank you!