ULBS
Universitatea "Lucian Blaga" Sibiu

Computing Resources for Data Analytics and Decision Optimization

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IBM Smarter Computing Initiative Roundtable

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Research and Communications Structures

- **Research centers**
  - **The Advanced Computer Architecture and Processing Systems (ACAPS) Research Centre**

    Faculty of Engineering "Hermann Oberth"

    http://acaps.ulbsibiu.ro/index.php/en/
  - **Research Center in Communication Science and Information Technology (CSIT)** ***Faculty of Sciences***

    http://stiinte.ulbsibiu.ro/info/csit/
- **The Department of Communications and Marketing (DCM)**

  http://www.ulbsibiu.ro/ro/ccom/

Fields of interests

- ACAPS
  - Advanced Computer Architectures, Parallel and Distributed Systems, Context Prediction in Ubiquitous Computing, Document Classification, Automatic Design Space Exploration, Network-on-Chip architectures
- CSIT
  - Approximation and Optimization, Coding Theory, Classification, Metaheuristcs, Artificial Intelligence, Modelling and Simulation

Attributions of DCM

- Administration and development of ULBS metropolitan network (INTRANET)
- Internet and intranet administration, web-hosting, web-design, web-mail, database management, accountancy, personal ID cards management
- RoEduNet knot (presence point in Sibiu)
- Service to the university's IT equipment

High Performance Computing Resources

- **ULBS High Performance Computing (HPC) system – for research**

  ACAPS Research Lab (IBM equipment)

  - **30 Intel Xeon E5405** homogenous quad cores (15 blades, 120 cores), operating at 2 GHz. This means a total of **120 Intel cores**.
  - **4 IBM Cell** Broadband Engine (Cell BE) processors (2 blades, 36 cores). The IBM Cell is a heterogeneous multicore, consisting of a 64-bit dual thread PowerPC (master) core plus 8 SIMD processors. These (slave) processors, called SPU (Synergistic Processor Unit), are specialized for data intensive processing domains like cryptography, media and scientific applications.
  - The HPC allocates 4.84 GB of DRAM memory for each two Intel quad cores and 7.85 GB of DRAM memory for each two IBM Cell cores. This means a total of **88.3 GB of RAM** memory. The total storage capacity is approximately **1.2 TB of disk.**
  - **The system uses the RedHat Enterprise 5.4 Linux Operating System;**

High Performance Computing Resources

- **DCM High Performance Computing (HPC) system**
  - Different types of servers **(IBM blade, HP, IBM and HP rackmount and tower servers)** and different **SAN storage systems** (Storage Area Network) **connected via Fiber Channel and iSCSI**
    - **116 CPU cores (Xeon Quad and Six-Core)**
    - **195 GB RAM ECC**
    - **The total storage capacity is approximately 25 TB of disk (from dedicated storage systems and servers' local storage)**

High Performance Computing Resources

- DCM High Performance Computing (HPC) system
  - Part of resources (systems) are dedicated
    - cluster for e-Learning portal
    - VMware ESXi 5.0 based cloud – for other specific applications of the university.
  - Currently load of resources is about 60%

Connectivity and

HPC resources extending possibility

- ULBS is connected to RoEduNet network by 2 circuits 1Gbps
- New resources can be easily added to the current HPC structure (BladeCenter IBM, BladeSystem HP)

Data Analytics and *Decision Optimisation* in current research topics (ACAPS)

- **Current directions of study**
  - Developing multi-core systems and also some automatic design space exploration tools, related to these systems
  - Power consumption issues in multi-core architectures
  - Classification
- **Current research topics (current research projects that requires High Performance Computing)**
  - Anticipatory Techniques in Advanced Processor Architectures
  - An Automatic Design Space Exploration Framework for Multicore Architecture Optimizations
  - Optimizing Application Mapping Algorithms for NoCs through a Unified Framework
  - Optimal Computer Architecture for CFD calculation
  - Adaptive Meta-classifiers for Text Documents

http://acaps.ulbsibiu.ro/index.php/en/projects/current-projects

PhD Thesis requiring HPC

- **Daniel I. Morariu**, ***Contributions to Automatic Knowledge Extraction from Unstructured Data*** *(Contribuţii la extragerea automată de cunoştinţe din masive de date),* PhD Thesis (in English), "Lucian Blaga" University of Sibiu, 2007 (conducator stiintific: prof. univ. dr. ing. Lucian Vintan);
- **Árpad Gellért**, ***Advanced Prediction Methods Integrated into Speculative Computer Architectures*** *(Metode avansate de predicţie integrate în arhitecturi cu procesări speculative),* PhD Thesis (*Cum Laudae*), "Lucian Blaga" University of Sibiu, 2008 (conducator stiintific: prof. univ. dr. ing. Lucian Vintan; cotutela cu prof. univ. dr. doc. Theo Ungerer, Universitatea din Augsburg, Germania)
- **Radu Creţulescu**, ***Contribuţii la proiectarea sistemelor de clasificare a documentelor***, Teză de doctorat, Universitatea "L. Blaga" din Sibiu, 4 noiembrie 2011 (conducator stiintific: prof. univ. dr. ing. Lucian Vintan)
- **Horia Calborean**, ***Multi-Objective Optimization of Advanced Computer Architectures using Domain-Knowledge*** *(Optimizarea multi-obiectiv a unor arhitecturi avansate de calcul utilizând cunoştinţe de domeniu*), PhD Thesis, "L. Blaga" University of Sibiu, November 25th 2011 (conducator stiintific: prof. univ. dr. ing. Lucian Vintan).
- **Ciprian Radu**, ***Optimized Algorithms for Network-on-Chip Application Mapping*** *(Algoritmi optimizaţi pentru maparea aplicaţiilor paralele pe arhitecturi de tipul Network-on-Chip)*, PhD Thesis, "L. Blaga" University of Sibiu, November 25th 2011 (conducator stiintific: prof. univ. dr. ing. Lucian Vintan).

Research Grants

- **ACAPS** http://acaps.ulbsibiu.ro/index.php/en/research/grants
  - **12 Research Grants with Romanian National Research Council (CNCSIS), ICI - Bucharest, Akademia Gorniczo-Hutnicza Krakowie and INFOSOC, during the period 1998-2008.**
- **CSIT** http://stiinte.ulbsibiu.ro/info/csit/proiecte.html
  - **6 Research Grants with Romanian National Research Council (CNCSIS, CEEX), European Cooperation Projects (ERASMUS, SOCRATES), Baden Wurttemberg, Germania, during the period 2004-2009.**

Data Analytics and Optimization Decision in Master Courses

- Engineering Faculty “Hermann Oberth”
  - Department of Computers and Electric Engineering
    - Advanced Computing Systems
    - Embedded Systems
    - Ingineria Calculatoarelor in Aplicatii Industriale
  - Department of Engineering and Management
    - Managementul afacerilor industriale
- Faculty of Sciences
  - Department of Mathematics and Informatics
    - Advanced Information Systems and Technologies
    - Informatica manageriala
- Faculty of Economic Sciences
    - Analiza diagnostic a mediului de afaceri

Conclusions

- **Data Analytics and Decision Optimisation are topics developed in:**
  - **research activities and projects, PhD thesis, master courses**
  - **many ULBS research centers, many faculties and departments, Department of Communications and Marketing**
- **High Performance Computing Resources exist in ULBS but could be enlarge in order to increase the developlment in these directions (especially in the ACAPS research center).**
- **A national cloud computing platform appears as a viable solution in the future development in data analytics and decision optimisation.**

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Thank you for your attention !

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