



**AGH UNIVERSITY OF SCIENCE  
AND TECHNOLOGY**

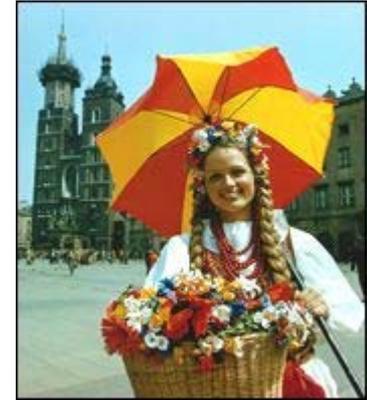


**Welcome to Kraków!**

*Cracow'08 Grid Workshop – CGW'08  
October 13-15, 2008*

## **KRAKÓW**

**the former capital, now a center of  
science, art, culture, and higher  
education**



**Kraków** – founded by Duke Krak  
in about 700 year.  
Over 800 000 inhabitants today.



Wawel Royal Castel and Cathedral (990)



Cloth Hall (XIII)



St. Mary's Basilica  
(1355-1397)

## Selected important dates

- 1257 – the location of the city according to Magdeburg Law
- 1364 – The King Kazimierz Wielki founded Krakow Academy
- 1596 – The King Zygmunt III Waza moved capital to Warsaw
- 1919 – foundation of Academy of Mining (AGH)
- 16.10.1978 – Cracow Archbishop Cardinal Karol Wojtyła elected as a Pope - John Paul II

**Technical University, founded in 1919  
as the Academy of Mining**

**Rapid growth in the 20s, after the  
World War II (University of Mining  
and Metallurgy), and in 90s**



- One of the oldest and biggest Polish technical universities
- **15 faculties, 29 specializations,** more than 160 fields of engineering
- Over **33 000 students**
- Over 150 000 graduates have passed through the halls our university
- **2 033 researchers** including **227 full professors** (more than 480 independent research workers)
- Own attended campus area



## FACULTIES

Faculty of Mining and Geoengineering  
Faculty of Metals Engineering and Industrial Computer Science  
**Faculty of Electrical Engineering, Automatics,  
Computer Science, and Electronics**  
Faculty of Mechanical Engineering and Robotics  
Faculty of Geology, Geophysics and Environmental Protection  
Faculty of Mining Surveying and Environmental Engineering  
Faculty of Materials Science and Ceramics  
Faculty of Foundry Engineering  
Faculty of Non-Ferrous Metals  
Faculty of Drilling, Oil and Gas  
Faculty of Management  
Faculty of Fuels and Energy  
**Faculty of Physics and Applied Computer Science**  
**Faculty of Applied Mathematics**  
Faculty of Applied Social Sciences

Interfaculty School of Power Engineering  
Interfaculty School of Biomedical Engineering

## OTHER UNITS

- Centre of Foreign Languages
- University Computer Centre
- Main Library
- Distance Education Study Centre
- Centre of Sports and Physical Education
- School of Environmental Protection and Engineering
- Centre of e-Learning



## Teaching lines

- Applied Computer Science
- Automatics and Robotics
- Biomedical Engineering
- Chemical Technology
- Computer Science
- Computer Science and Econometrics
- Construction
- Electrical Engineering
- Electronics and Telecommunications
- Power Engineering
- Environmental Engineering
- Environmental Protection
- Geodesy and Cartography
- Machine Design and Mechanics
- Management
- Management Engineering and Production System Management
- Materials Science
- Mathematics
- Mechatronics
- Metallurgy
- Mining and Geoengineering
- Sociology
- Technical Education
- Technical Physics



## PROFESSIONAL AND MODERN EDUCATION !

### **New specializations (2008/2009):**

- **Culture Studies**
- **Geophysics**
- **Oil and Gas Engineering**
- **Acoustic Engineering**
- **Medical Physics**

**The profile and scope of education as well as research at AGH is constantly changing and developing, as we are aspiring to be continually up to date with demands of the present times**





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## Research areas

### **Information Technology**

Computer Science  
Telecommunications  
Electronics

### **Electrical and Mechanical Engineering**

Electrical Engineering  
Mechanics, Construction and Operation of Machines  
Automatics and Robotics  
Mechatronics

### **Mining**

Mining Technologies  
Management of Energy Resources  
Oil and Gas Engineering  
Geotechnology and Building Engineering

### **Social-Economic Sciences and Humanities**

Management and Marketing  
Economics  
Information Society  
Sociology, Psychology and Philosophy  
Political and Historical Sciences



### **Energy and its Supplies**

Energy Technologies  
Renewable Sources of Energy

### **Environment and Climate Changes**

Environmental Engineering  
Environmental Protection  
Natural Resources and Waste Management  
Balanced Development

### **New Materials and Technologies**

Nanotechnologies  
Materials Science and Materials Technologies  
Metals Engineering  
Biomedical Engineering  
Geoengineering



CGW

### **Exact and Natural Sciences**

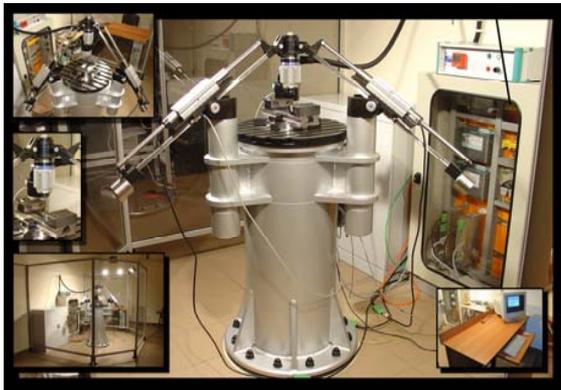
Mathematics  
Physics  
Chemistry  
Geodesy  
Geology and Geophysics



AGH

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**600 laboratories**



## COOPERATION

- Cooperation with 160 academic centres from 45 countries (e.g. the USA, Japan)
- Cooperation with numerous companies (e.g. IBM, Valeo, ComArch, Motorola, EDF, L.G., Philips, RWE Power AG, Lafarge, Cemex, Delphi, Siemens, KGHM)
- Participates in many research and educational programs e.g.: FPs of EU, SOCRATES-ERASMUS, CULTURE, INTERREG III, LEONARDO, TEMPUS, EUREKA, COST, e-TEN



## INTERNATIONAL COOPERATION IN EDUCATION

### Forms:

full/part abroad studies  
practices and trainings  
common education „double diploma”  
common schools  
staff exchanges



Un-Gelände mit Lernplätzen der Vorkurslehre



Technische Universität  
Bergakademie Freiberg

### In the framework of:

**SOCRATES-ERASMUS** and other programmes  
education agreements  
international education networks

**The Campus is the largest in Poland and comprises 20 students hotels on the area over 16 ha. The hotels have in total 9 220 places (7 400 for our University students).**

**The „Students City“:**

- hotels
- student clubs
- Student Radio
- post office
- bank
- sports hall
- playgrounds with tennis court
- groceries
- supermarket
- newspaper stands
- bookshops
- bars and restaurants
- service shops
- kindergarten
- etc. ...



**up-to-date gigabyte computer network  
and a wireless WiFi net**



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**We take care of health and physical education !!!**



## INVESTMENTS



**Computer Center**



**Conference Center  
(for 670 places)**



**Swimming-pool**

CGW'08



**Main library**



Prof. Stanisław Kurzawa  
1st Dean of the Faculty

Created on 1st October, 1952 after division of the Faculty of Electromechanics into the two:

- **Faculty of Electrification of Mining and Metallurgy**
- Faculty of Mechanization of Mining and Metallurgy

Next steps – development towards electrical engineering and IT

- Faculty of Electrical Engineering of Mining and Metallurgy (since 1.10.1957)
- Faculty of Electrical Engineering, Automatics, Electronics (since 1.10.1975)
- **Faculty of Electrical Engineering, Automatics Computer Science and Electronics** (since 25.02.1998)

## Buildings



'08

## Faculty units

- 1. Department of Automatics**
2. Department of Electrical Drives and Industrial Equipment
3. Department of Electrical Engineering and Electrical Power
- 4. Department of Electronics**
- 5. Department of Computer Science**
6. Department of Electrical Machines
7. Department of Measurement and Instrumentation
- 8. Department of Telecommunications**

## **Educational disciplines**

1. Electrical Engineering
2. Automatics and Robotics
3. Computer Science
4. Applied Informatics
5. Electronics and Telecommunication
6. Power Engineering
7. Biocybernetics and Biomedical Engineering
8. Acoustic Engineering

**Total number of students over 5 000.**

**The Faculty is entitled to confer scientific degrees  
Doctor Habilitatus and Ph.D. in:**

1. Automatics and Robotics
2. Electrical Engineering
3. Electronics
4. Computer Science
5. Telecommunication

**and Ph.D. degree in:**

Biomedical Engineering

## **Main research lines**

**Distributed network systems related to the GRID infrastructure, multimedia services, multiprocessor systems, parallel algorithms, computer linguistics, agent systems**

**Modelling, performance, QoS, and reliability analysis of communications networks; planning and analysis of mobile communication systems; research in the area of new generation networking, including automatically switched optical networks (ASON) and access networks; techno-economic analysis of telecommunication networks**

**VLSI integrated circuits, ASIC full custom, FPGA, optoelectronic systems, digital signal processing, SOI silicon ionizing radiation detectors, wideband radio channels; distributed intelligence networks; micro- and nanostructures for microelectronics, optoelectronics, spinotronics and gas sensors**

**Theory of control and computer control systems, methods of biomedical signal analysis and vision systems, software engineering, real-time systems, computer systems for management**

## **Main research lines cont.**

**Intelligent control systems for buildings, quality and efficiency of electric energy use, automation of electric drive, power electronics, electroheat, electric traction**

**Measurements, identification and diagnostics of electric machines**

**Design and analysis of electrical power networks and systems, investigation of insulation systems in HV devices**

**Analysis of chaotic systems, analysis of dynamics of non-linear systems, non-linear dynamics methods for signal processing**

**Mathematical modelling, simulations, design and construction of measuring systems**

## ACC CYFRONET AGH

**The Academic Computer Centre CYFRONET AGH, established 35 years ago, is an autonomous organizational and financial entity of the AGH University of Science and Technology in Cracow. ACC CYFRONET AGH is one of the largest Polish supercomputing and networking centres.**

## Mission

- offer access to its computational facilities and networking services to universities and research institutes;
- maintain and develop its computer and networking infrastructure;
- perform research activities in the area of high-performance computing, computer networks, and telecommunications;
- perform consulting, expertise, training and educational activities in the area of general computer science, computer networks, high-performance computing and development of computing infrastructures;
- research, evaluate and promote new solutions for science, education, administration, business and management;
- provide computing resources and other services to third parties (as long as those activities do not conflict with the above aims).

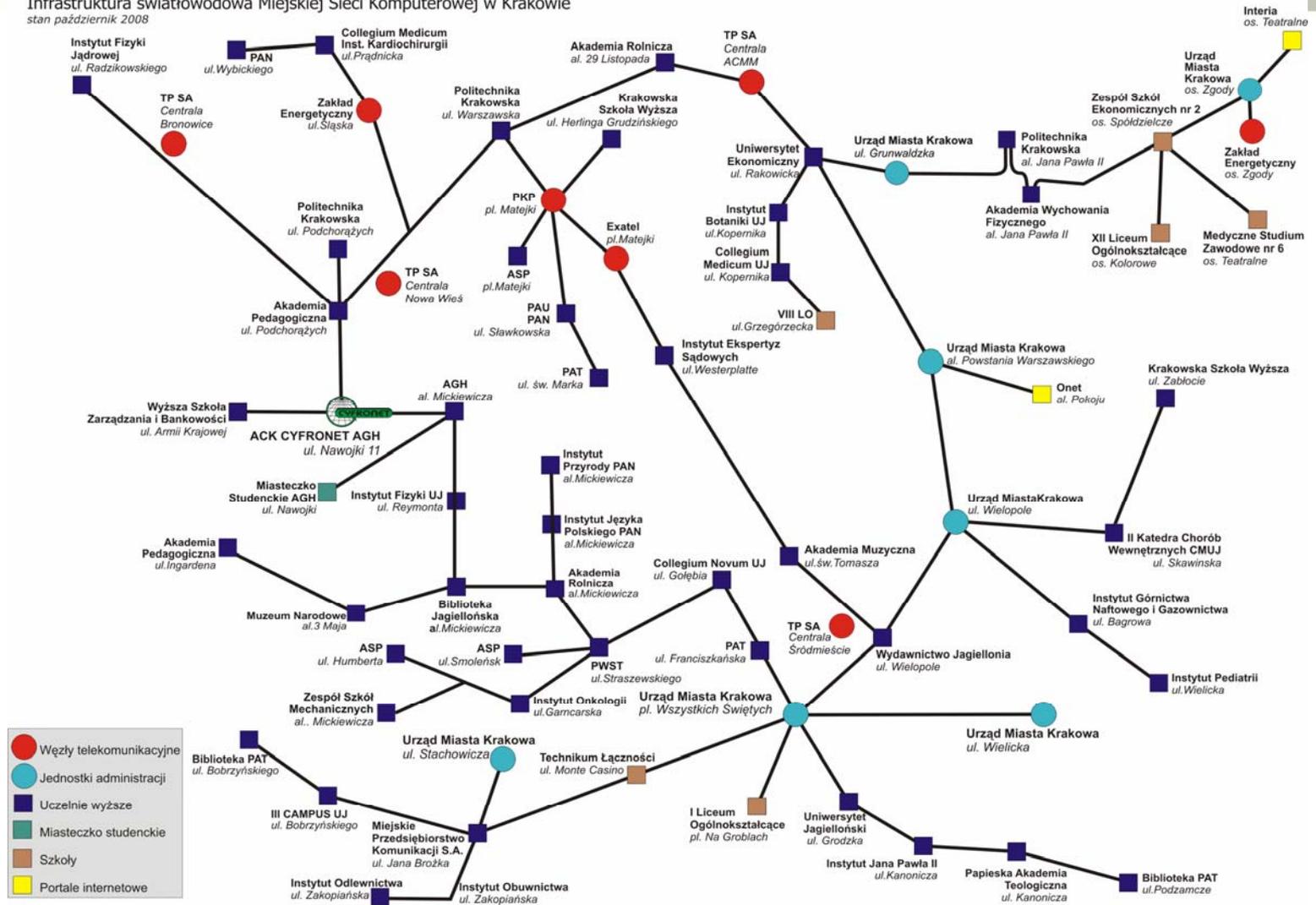
The Centre is assisted by an advisory board - **The Centre Users Council** - established by the Rector of the AGH in collaboration with the Council of University Rectors of Cracow and acting in accordance to rules established by this Council.

## Main characteristics of the Cracow MAN

- The MAN uses its own dedicated fiber-optic links which total nearly 90 km in length.
- The data link layer is implemented using Cisco Systems equipment while the hardware layer involves ATM and Gigabit Ethernet technologies.
- The Cracow MAN is directly connected to the Upper Silesia and Warsaw regions with 2x10 Gbps PIONIER links and a backup 1 Gbps link with the city of Rzeszów. The PIONIER network enables communication with major national and foreign computing centres. International connectivity is achieved through the GEANT scientific network.
- In addition to the GEANT network, the Centre is also connected to the Level 3 backbone via a 320 Mbps backup link.
- The Border Gateway Protocol (BGP) enables automatic traffic switching should one of the Centre's international links fail.

## Infrastruktura światłowodowa Miejskiej Sieci Komputerowej w Krakowie

stan październik 2008



# PIONIER – Polish Optical Internet



## High Performance Computers I

### **IBM BladeCenter HS21 XM**

98 Intel quad-core processors, 784 GB RAM

### **IBM BladeCenter HS21**

112 Intel dual-core processors, 448 GB RAM

### **HP Integrity rx2600 cluster**

56 Intel Itanium 2 processors, 56 GB RAM

### **PC cluster**

384 processors, 440 GB RAM

## High Performance Computers II

### **SGI Altix 3700**

256 Intel Itanium 2 processors, 512 GB RAM

### **SGI Altix 4700**

32 Intel Itanium 2 processors, 64 GB RAM

### **SGI® RASC™ (Reconfigurable Application Specific Computing)**

RASC module leverages the power of FPGAs which utilize gate array technology that can be reconfigured by the user for optimal performance on a specific algorithm.

Dual Virtex 4 LX200 FPGAs

**Currently CYFRONET provides 10 Tflops of installed computing power**



## **Data Storage System resources**

HP XP12000 disk array  
HP EVA8000 disk array  
HP EVA8100 disk array  
**Sun X4500 server**  
**6 Sun X4540 servers**

## **Summary performance characteristics:**

Total physical storage space 541TB, including:

- 6 TB on high-performance FC disks
- 211 TB on economy FATA disks
- 324 TB on economy SATA disks



## Mathematical applications:

- MATHEMATICA
- MATLAB
- MAPLE

## Chemical applications

- **GAUSSIAN** - devoted to calculating molecular orbitals using semi-empirical and ab initio methods.
- **Accelrys software** - integrated visualization systems, including packages for modeling large-scale molecules and solid-state bodies in the process of drug design.
- **Tripos software** - an integrated toolset for modeling small particles, proteins, enzymes and drugs. The system also integrates user-defined and commercial databases of molecular structures.

## **CAD/CAE applications**

**ABAQUS** - devoted to solving complex problems regarding the durability of engineering constructs and devices. Enables finite-element analysis and supports very rapid events, such as impact models.

**ANSYS** - a complex structural simulations package for nearly any area of science or business. ANSYS enables linear and nonlinear structural analysis of contact phenomena, plasticity, recoil etc. ANSYS also supports analysis of constant and variable temperature fields including convection, thermal conductivity, phase shifts etc.

**FLUENT** - a CFD (Computational Fluid Dynamics) package enabling detailed fluid dynamics studies with no need for time-consuming and costly experiments. OPERA - a computing package which uses the finite elements method for analysis of electromagnetic fields in complex physical structures.

**MSC** software - enables modeling of any complex structure or object with focus on adiabatic and isothermal reactions, tensions, dislocations, heat transport, mass transport, acoustics and piezoelectric phenomena.

## Information processing

**SAS** - a modern information processing system comprising a wide range of modules for analysis of large datasets in support of market research decisions, experiments and other dilemma. the available data.

**ORACLE** - a relational database managment system.

## Geographical Information Services

ARC/INFO - a system for managing and visualizing geographical data, supporting the development of detailed high-quality maps. An integrated image and spatial data analysis system offering a wide range of tools for visualization and creation of maps, classification and cropping functions and a so-called rectification mechanism.

## Projects I

### European projects developed at ACK CYFRONET AGH within the 5th Framework Programme

- **6WINIT - IPV6** Wireless Internet Initiative - This project involved development of wireless communications for IP networks using the IPv6 protocol. In addition to technical tools and services, 6WINIT also included application tasks related to the use of wireless access in medicine.
- **CrossGrid** – The aim of this project was to extend the Grid to a new category of applications which involved interaction with a person in a computing loop.
- **PELLUCID** - A Platform for Organizationally Mobile Public Employees.
- **GRIDSTART** – This project clustered all 5FP IST-funded Grid research projects with the intention to stimulate wide deployment of appropriate technologies and to support early adoption of best practices.
- **PRO-ACCESS** – Improving Access of Associated States To Advanced Concepts In Medical Informatics.
- **In 2002, CYFRONET received the European Commission award for the most active participant of the EU 5th Framework Programme in the Malopolska Region.**



## **AGH Projects II**

### **European projects developed at ACK CYFRONET AGH within the 6th and 7th Framework Programmes**

- **EGEE** – Enabling Grids for e-Science in Europe.
- **CoreGRID** – The CoreGRID Network of Excellence (NoE) aims at strengthening and advancing scientific and technological excellence in the area of Grid and Peer-to-Peer technologies..
- **K-WfGrid** – The main goal of the K-WfGrid project is developing a system that will assist its users in composing powerful application workflows from individual services deployed in the Grid infrastructure.
- **ViroLab** - to provide researchers and medical doctors in Europe with a virtual laboratory for studying infectious diseases. Particular attention is devoted to study of the HIV virus and its resistance against selected drugs.
- **Gredia** - to create a reliable Grid application development platform with high-level support for the design, implementation and operational deployment of secure Grid business applications.
- **Int.eu.grid** - to deploy an advanced Grid infrastructure in the European Research Area.



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***All the best during the Workshop time !***

***Enjoy your stay in Kraków !***