INSTITUTE OF COMPUTER SCIENCE
Masaryk University
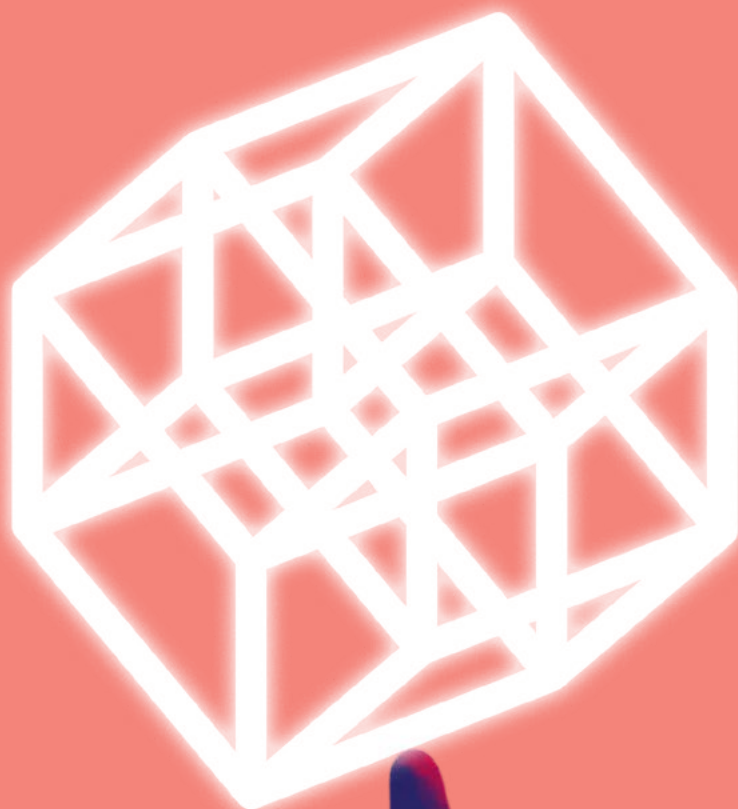
ANNUAL REPORT 2016

TABLE OF CONTENTS

INTRODUCTION

The Institute of Computer Science completed a phase in its development in 2016, one that grew out of the Institution's prior developmental cycle in which research was funded via operational research projects. The university's preparations for successfully participating in the Operational Program Research, Development and Education (OP RDE) led to intensified collaboration between the Institute and all MU units and components, and we continued our support of the university administration by continuing our digitization efforts and by streamlining internal decision-making processes.

Also reinforced was our research focus on specific areas of cyber security, as well as on developing and making efficient use of large IT infrastructures. The results of our research frequently reflect in the design and operation of the university's IT infrastructure and its security, thereby contributing to the creation of leading-edge IT facilities at MU.

Our Cyber Polygon, a high-tech environment that is capable of simulating any IT infrastructure and testing potential attacks against it, was recognized not just once, but twice. First Czech Prime Minister Bohuslav Sobotka came to the university to attend Cyber Czech 2016, a nationwide cyber readiness drill. Then, in late 2016, the team of investigators who worked on the original Cyber Polygon project was recognized by the Ministry of the Interior for extraordinary research results. In addition, the CSIRT-MU Security Team became the first to receive the Trusted Introducer certification, a confirmation of superlative quality and professional competence. And the Institute's research efforts were bolstered by six successful new projects. Assessment of an extensive project developed by the C4e Centre, prepared in answer to an OP RDE call for excellence in research support, is also underway.

The ELIXIR CZ national consortium entrusted the ICS with coordinating the preparations and subsequent implementation of the ELIXIR CZ: Capacity Building project as part of an OP RDE call for research infrastructure support. Following the CERIT-SC project, this is the second research infrastructure project to have been coordinated by the institute. We have intensified our collaboration with the BMRI CZ and CzeCOS research infrastructures. Targeting our accelerators and large data volume analyses in our research has allowed us to reinforce the synergy between our work and that of the C4e Centre.

We have also continued to provide support for background and administrative processes at the university. In 2016, we focused on digitizing processes used in asset and HR administration that reflected changes in legislation, while taking into account preparations for the Contract Registry, tax reports, etc., into account. Other Czech universities have expressed an interest in INET, MU's intranet. As part of our contractual collaboration with the Ministry of Education, Youth, and Sports, we developed a Student Registry, along with a number of other registries. We also began collaboration with the Institute of Health information and Statistics of the Czech Republic.

Late in 2016, we began work on updating the Institute's Organizational Code and streamlining our internal infrastructure. In this way, ICS has begun preparations for a new funding cycle via OP RDE and other projects, as well as preparing for the impact of the GDPR European Directive, which will govern work with confidential data. ICS will also intensify its efforts to support MU by effectively applying and utilizing information technology.

prof. RNDr. Luděk Matyska, CSc.

Director

NINE KEY ICS SUCCESSES

1

A new online image for MU

We launched the new muni.cz website, with a simple, clear information for the public, students, employees, and applicants for study at MU.

2

Build websites simply

We created the universal Muniweb webkit for all MU faculties and offices to use. If it's a newsletter you're interested in, that's easy too.

3

Work with the latest tools

We began to roll out Microsoft Office 365 as a common environment for communication and collaboration across the university.

4

Find your way with us

We've made the munimap map library available to the general public. It shows the plan of buildings and rooms and is available on the university website.

5

Work online safely

The CSIRT-MU security team is the first Czech team to have been awarded the prestigious Trusted Introducer certificate.

6

Research recognized by a ministry

The Cyber Polygon project team received the Minister of the Interior's Award for Exceptional Results in Security Research, Experimental Development and Innovation for 2016.

7

A virtual environment for real-world use

We launched a new cloud environment at the university built using Openstack technology.

8

Steady access to research information

We took part in setting up the national CzechELib centre, which will serve as a long-term source of electronic information for all of academia in the Czech Republic.

9

IT experts in international academic research projects

We were involved in six EU projects and played a key role in the international West-Life project. We successfully bid on two projects for 2017—OP VVV ELIXIR-CZ Capacity Building and CERIT Scientific Cloud—in the amount of CZK 167 million.
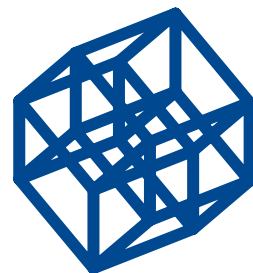
USER SUPPORT

WHAT WE DO

→ Provide user and technical support
→ Offer specific IT solutions
→ Consult about IT procurement
→ Hold seminars for academic and
   non-academic staff

KEY EVENTS IN 2016

→ System-wide support for the transition
  to Windows 10
→ Extensive consultation on the impact
  of OP RDE projects on IT
→ Start of collaboration with
  CzechGlobe—Global Change Research
  Institute of CAS
→ Transition to the new version of the
  SafeQ printing system

ROLLOUT OF WINDOWS 10 IN CENTRAL ADMINISTRATION

→ We took advantage of the free upgrade and made the transition to Windows 10.

→ As part of the process, we expanded support for Central Administration and upgraded the operating system on the computers we administer for the university.

→ With the change to Windows 10, we have begun offering support for a fully English environment in computer study halls.

WE PROVIDE SUPPORT AND CONSULTATIONS ON THE DEVELOPMENT OF UNIVERSITY PROJECTS

→ We provide consultations to assess the impact that projects in preparation (especially OP VVV) will have on the university's infrastructure. Almost no high-level academic discipline today can function without substantial IT infrastructure to store and compute large volumes of data. Research plans, particularly if they involve equipment purchases, should therefore be complemented by plans for investment in IT infrastructure.

→ In 2016, we consulted on the impact of several dozen IT infrastructure projects across the university and helped project designers specify adequate technology purchase plans.

We support
1,521
employee computers at the university, now in English, too

We administer
2,840
computers in all,

1,107
for students running Windows 10,
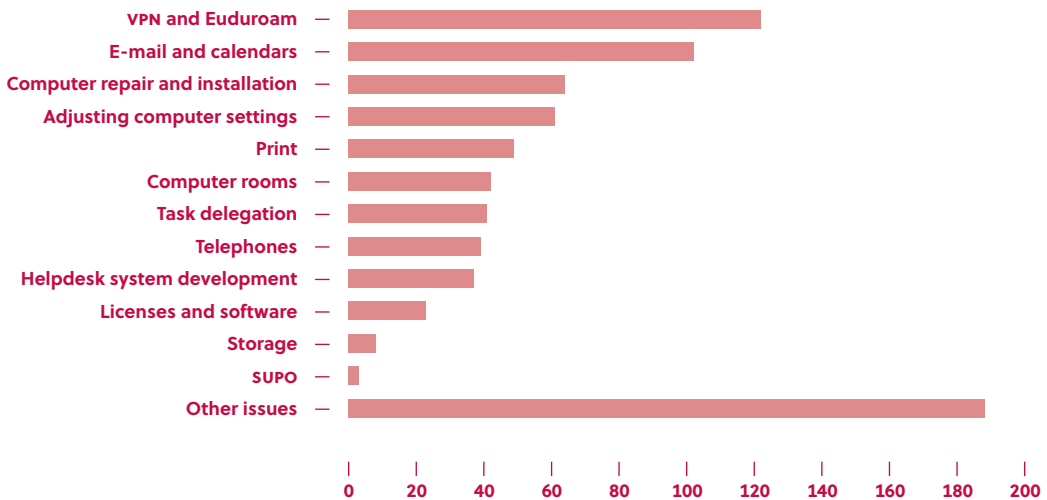*212*
for students running Windows 7

250
for employees running Windows 10,
1,271
for employees running Windows 7

Issues resolved in the electronic helpdesk system by area

Area	Value
VPN and Euduroam	~123
E-mail and calendars	~102
Computer repair and installation	~63
Adjusting computer settings	~61
Print	~48
Computer rooms	~42
Task delegation	~41
Telephones	~40
Helpdesk system development	~37
Licenses and software	~24
Storage	~8
SUPO	~4
Other issues	~188

WINFO — A COMMUNICATION PLATFORM FOR UNIVERSITY IT ADMINISTRATION

➜ We created a portal in the Office 365 environment to support collaboration between ICS and other IT departments at the university. It supplements regular meetings with IT administrators and serves to circulate information about joint activities and themes.

➜ One goal is to share experiences and important information that may include help in solving problems. The themes on the portal are gradually expanding and now include central administration and Office 365.

GOT AN IT PROBLEM? HELPDESK CAN HELP!

➜ The IT Helpdesk is your go-to resource for IT support at Masaryk University. It will help you solve any problems that come up, or pass your request to the appropriate expert.

➜ You can reach us through our universal user support e-mail address, helpdesk@ics.muni.cz, or via telephone at (549 49) 7722.

➜ We handled 779 requests in 2016 from students and employees at faculties and offices across the university. Other requests in the areas of finance and HR we addressed in tandem with users via the special INET helpdesk application.

PERSONNEL AGENDA AND ELECTRONIC OFFICE

WHAT WE DO

→ Optimize and provide electronic access to financial and administrative processes

→ Provide internet access via the Eduroam and Muni WiFi networks

→ Administer and develop the university's tools for communication and collaboration

→ Issue and take photographs for ID cards for university students, staff, graduates, and external users of university services

→ Provide access to internal university resources through a virtual private network (VPN)

→ Administer the university's e-mail gateway

→ Issue university software licenses

→ Administer access and security systems in university buildings

→ Provide framework contracts for the acquisition of standard computer technology

KEY EVENTS IN 2016

→ Electronic office in Assets and HR

→ E-signatures in ISEP via RemSig

→ Preparing of the Office 365 environment for rollout across the university

→ Preparing to roll out Yammer to support internal communications

THE PERSONAL ELECTRONIC OFFICE IN INET

We've been working on building personal e-office capabilities in INET since 2000. Central elements include:

➜ A directory of personal applications that offers a structured overview of the main "office" applications intended for employees and others.

➜ A signature book that collects in a single location links to various types of documents for processing and includes a notification and access management system. Since 2015, the signature book has been available as well for Android devices.

➜ We are gradually translating the e-office applications into English, so that foreigners working at MU can use it. In 2015, for example, we made the Project Proposal Editor in ISEP available to English-speaking users.

Expansion of the e-office in 2016 was primarily focused on asset administration and HR. Electronic asset write-offs and holiday scheduling were put into routine operation. Asset inventory lists may also now be confirmed electronically, and support has been added for collecting and approving teaching work agreement requests. Project administration saw the addition electronic project timesheet approval and signature using RemSig.

The e-office is being expanded to include an English version on an ongoing basis to allow the system to be used by foreign nationals at the university. In 2016, we provided this access for financial controls, linear approvals, accounting and budget statements and project administration applications.

E-Office

We oversee
18
comprehensive economic and administrative agendas in the Signature Book

We processed
155 000
documents using the Signature Book

E-Mail Portal

In 2016, we successfully delivered almost

40,000,000

emails

That's

110,000

messages per day.

We rejected another
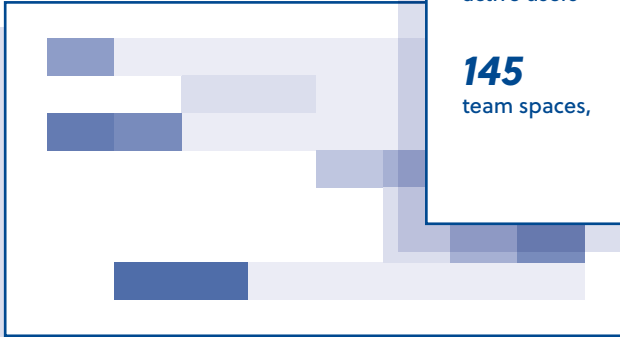
65,000,000

bad, virus infected, and spam

emails

Office 365

Office 365 already has

2,337

active users

with

135

of them active

145

team spaces,

OneDrive storage totals

7.7 TB

of user data

E-MAIL

We operate systems for receiving and sending e-mail, including anti-virus scanning and spam detection. Our email system is our own, supplemented by Office 365 cloud services.

WE USE OFFICE 365 SERVICES IN THE UNIVERSITY ENVIRONMENT

Standard support for Office 365 applications (online Exchange and Share-point) has been expanded to include other applications like Yammer and Skype for Business. As part of preparing a new communications platform for the university, we have begun gradually integrating Office 365 into the university's various environments and providing access to all members of the academic community.

ID CARD PHOTOGRAPHS AND PRINTING

We photograph students, employees, and other users of university services for ID cards, as well as for uploading into the information system so that ID cards can subsequently be created. We provide photographic services on a year-round basis in the centre of Brno and on the university campus. During the summer enrolment period, we work on an intensive schedule that also includes locations at various university faculties. In 2016, we began regularly issuing ID cards for alumnae and external library users.

PROVIDING UNIVERSITY SOFTWARE LICENSES

As we do every year, based upon the needs of each faculty, we acquired licenses for Eset NOD32 Antivirus and Eset Smart Security antivirus for the university's computers.

Photography and ID Cards

In all, we photographed
9,813
persons

and issued
11,000
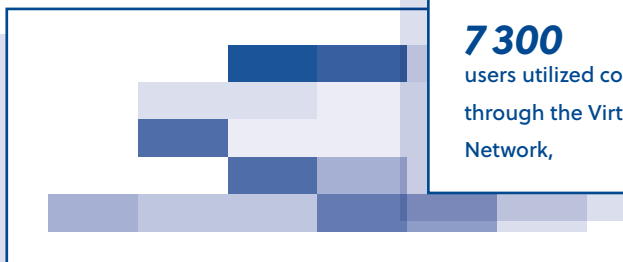ID Cards

Eduroam

A total of
70,000
university staff, students, and guests made use of the Eduroam Wifi network

VPN

7 300
users utilized connection through the Virtual Private Network,

making a total of
322 641
connections

EASIER LOGIN FOR SYSTEM USERS

In 2016, we worked on developing a new environment for individual university identities, including unifying selected systems— the Office 365 environment, the UKB identity, Guestmanager, authentication via the university AD, access and security systems, student printing systems, and others. Unified identities make for safe access to these systems and services without requiring student and staff users to register individually and log in each time. We have similarly streamlined access for partners outside the university to the services they use.

NEW ACCESS SYSTEM INTRODUCED FOR CPS

We updated the outdated access system in the CPS (the University Computer Centre), both hardware and software components. The improvements included modifications to all parts of the system, including interconnection to the university's new system of identities. The groundwork was also laid for the planned 2017 transition of faculties that employ a single system (the Faculty of Economics and Administration, the Faculty of Education, and the computer rooms at the Faculty of Law).

CERIT-SC CENTRE AND COLLABORATION WITH RESEARCHERS

WHAT WE DO

→ Operate the infrastructure and encourage the innovative use of the CERIT-SC Centre

→ Conduct research that supports the development of IT infrastructure

→ Conduct interdisciplinary research and development with research partners, including supervising interdisciplinary student theses

→ Take a direct part in national and international research projects

→ Participate in the CR Roadmap of Large Infrastructure for Research, Experimental Development, and Innovation—CERIT-SC is an important component in the national e-infrastructure, directly connected to the EGI

KEY EVENTS IN 2016

→ OP VVV ELIXIR-CZ Capacity Building and CERIT Scientific Cloud projects were submitted and complementary projects were prepared under the programme of Large Infrastructures for Research, Experimental Development and Innovation of the Czech Republic

→ Designation of the Centre's research programmes and additions to the research team

→ Leading the key activity in the EU H2020 Worldwide E-infrastructure for Structural Biology—West—Life project

→ Successful completion of interdisciplinary projects funded by GA MU, GACR, TACR, EU FP7

CERIT-SC CENTRE

The CERIT-SC (CERIT Scientific Cloud) Centre is a national centre that operates computational and storage infrastructure for realizing extensive "in-silico" experiments, normally in close cooperation with other academic disciplines. It targets experimental, innovative use of its resources, and is built on three interconnected pillars:

➔ **Providing computational and storage capacity to the academic community** — a diverse range of computing nodes, from 8-core CPUs with 96 GB of RAM to SGI UV systems with 384 cores and 6 TB of RAM, as well as storage capacity for user data like ordinary disk systems and hierarchical archive storage. Users may avail themselves of a standard environment with a batch management system and hundreds of installed applications, or run their own virtual machines.

➔ **Excellent research** in selected areas of computer science:

   ➔ Big data analysis—processing large volumes of normally unstructured data, searching for unknown patterns.

   ➔ High performance computing—developing and optimizing algorithms, in particular those aimed at parallel and distributed computing and at accelerators (at present GPU and Xeon Phi).

CERIT-SC Centre in 2016

1,611
users,

who ran calculations amounting to
4,161
CPU years working with
550,000
tasks

Total data stored
2.5 PB

Users recognized the CERIT-SC Centre for the use of infrastructure in
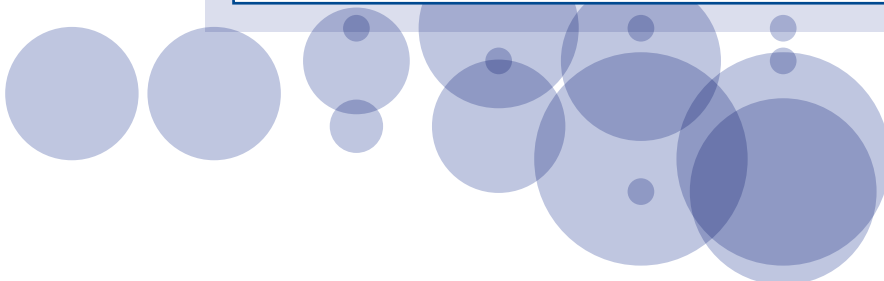*88*
publications in the Web of Science Core Collection.

The CERIT-SC team published
17
times

➜ The configuration and optimization of e-infrastructure (cloud) customized for particular uses such as simulating large-scale energy systems, training cyber security, and so on.

➜ Planning and utilizing computational resources specially designed for use in a virtual environment and fair planning strategies.

➜ **Long-term collaboration with user groups** from many academic disciplines that are research partners of the centre, not just providers of "canned" technical solutions.

JOINT INTERDISCIPLINARY RESEARCH

We collaborate with research partners from Masaryk University, elsewhere in the Czech Republic, and abroad in many academic disciplines.

Energy
In conjunction with the Global Change Research Institute CAS, Mycroft Mind, a.s. and NESS Czech, s.r.o., we proposed and developed a modular platform for providing detailed meteorological forecasts for the energy industry. Results of the project are being used to forecast electrical energy consumption and energy production in photovoltaic and wind power plants, thereby ameliorating the negative impact of climate change.

4
national and
3
international projects

2
newly submitted infrastructure projects with a total budget of
CZK 167,000,000

2
international projects and
1
national project under submission
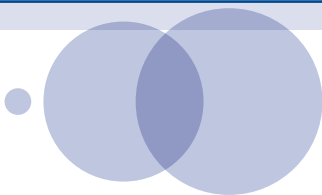
Climate models

In cooperation with the Global Change Research Institute of the Czech Academy of Sciences we are developing tools for transferring climate data between global models that have been developed in different countries (including the Czech Aladin model).

As part of this collaboration, we have also become involved in an extensive simulation of climate development caused by changes in the concentration and dispersion of organic pollutants (including CO_2 production) in the environment.

Computational chemistry and structural biology

As part of a GACR project, we designed and implemented a method for calculating variables in molecular metadynamics. Without introducing significant errors, the method reduces the number of calculations necessary by many orders of magnitude in calculating the distance between atoms, substantially accelerating the process.

As part of a GA MU project, we implemented the novel 'Ensemble Fitting' method to determine the conformation proportions that best correspond to SAXS experimental data, leading to a more precise determination of the structure of biomolecules in solution. The implementation is available on the saxs.cerit-sc.cz website.

In the H2020 Westlife project, we worked in collaboration with the Madrid laboratory Centro Nacional de Biotecnología on speeding up the calculation process in treating molecular images from electron microscopes (cryoelectron microscopy). We worked on a similar project with CEITEC.

Our researchers have taken part in the authorship of
24
Publications, including

9
anthologies

8
journal articles, and

4
prototypes

Bioinformatics

In conjunction with the research Centre for Toxic Compounds in the Environment, we are developing a LAS instrument for recording frozen samples that was launched last year at University Hospital Brno.

The CERIT-SC Centre it is an official partner of the Czech national node ELIXIR CZ and in conjunction with CESNET is responsible for developing and operating computational and storage infrastructure and providing IT expertise. The international ESFRI project ELIXIR and the national node are using the Perun System we developed to administer identities.
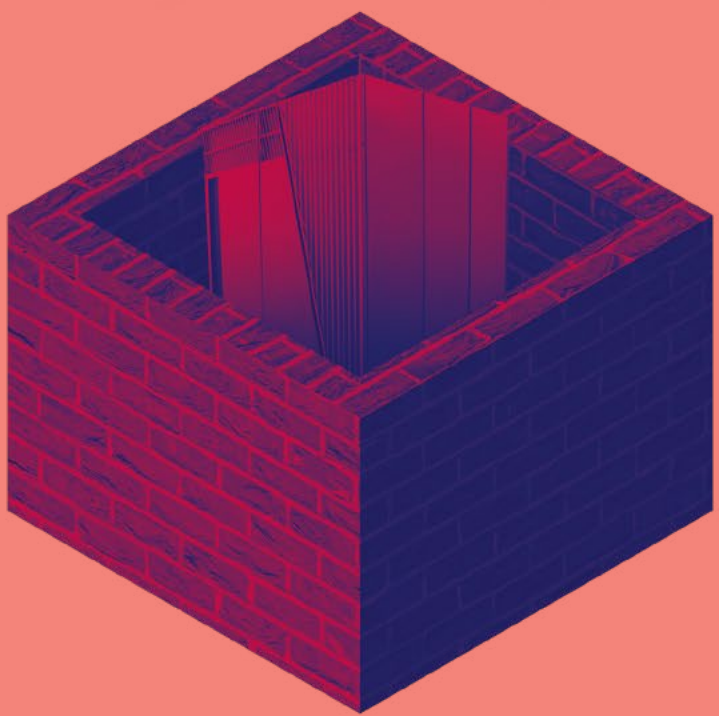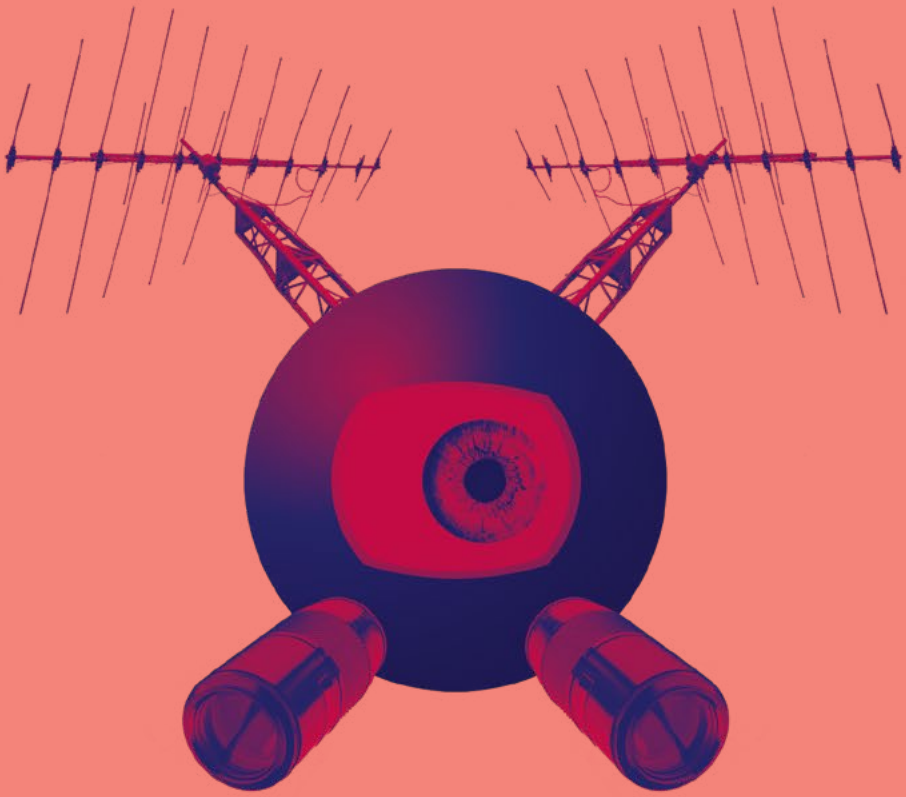
C4E CENTRE OF EXCELLENCE AND CYBERSECURITY

WHAT WE DO

→ Ensure a secure cyber environment at the university through the CSIRT-MU security team

→ Coordinate steps and address security incidents in the MU network

→ Manage user digital identities and access to services

→ Conduct research and development in topical areas related to cybersecurity

→ Collaborate nationally and internationally in cybersecurity

KEY EVENTS IN 2016

→ Certification for the CSIRT-MU security team

→ Implementation of cybersecurity technical exercises: Cyber Czech

→ Organization of an Erasmus MUST Week focused on security

→ Penetration testing of IT systems being launched at MU

→ Introduction of the Perun system for user administration and management of access to services provided at MU, CEITEC, and the National Centre for Biomolecular Research (NCBR).

→ Launch of csirt.muni.cz, the MU security team's website

C4E CENTRE OF EXCELLENCE

The Czech Cyber Crime Centre of Excellence (C4e) is an academic centre of expertise created as one of two research centres at ICS that target excellence in research, development, and education in the area of cybercrime, cybersecurity, and the protection of critical information infrastructure.

Research activity is divided into three areas:

➜ Cybersecurity — the research team primarily focuses on the modelling, analysis, and suppression of cyber attacks and cybercrime against a background of constantly growing numbers of new threats.

➜ The law — the C4e legal team focuses on analyzing and revising the national legal code, adapting it to European law, and undertaking comparative analyses and development of individual legal implementation instruments.

➜ Safeguarding infrastructure — the focus in this area is on advanced techniques and implementation of resilient IT infrastructure, particularly from a security standpoint and as regards reliability and the protection of confidential data.

Projects

Live-for
This project targets the identification of obstacles to the implementation of the 2014/41/EU Directive on the European Investigation Order in Criminal Matters and also disseminates information on the use of this procedural instrument in criminal proceedings between affected bodies. Another aim is to find appropriate mechanisms for using the European Investigation Order to facilitate the cross-border transfer of electronic evidence.

SENTER
The objective of this project is to create a well-coordinated international network of national centres of excellence that will be able to make effective use of funding in a common approach to fighting cybercrime. Another important aspect of the SENTER project is to share experiences and the results achieved.
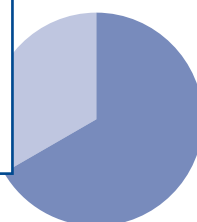
In 2016, we started implementation of
2
projects

and obtained
4
new projects in the cybersecurity field

SmartGrid

SmartGrid encompasses several contract research projects implemented by MU in collaboration with the Czech Academic Expert Group for SmartGrid. These projects aim to design technical, legal, and security parameters for implementing intelligent measurement systems in electrical energy infrastructure.
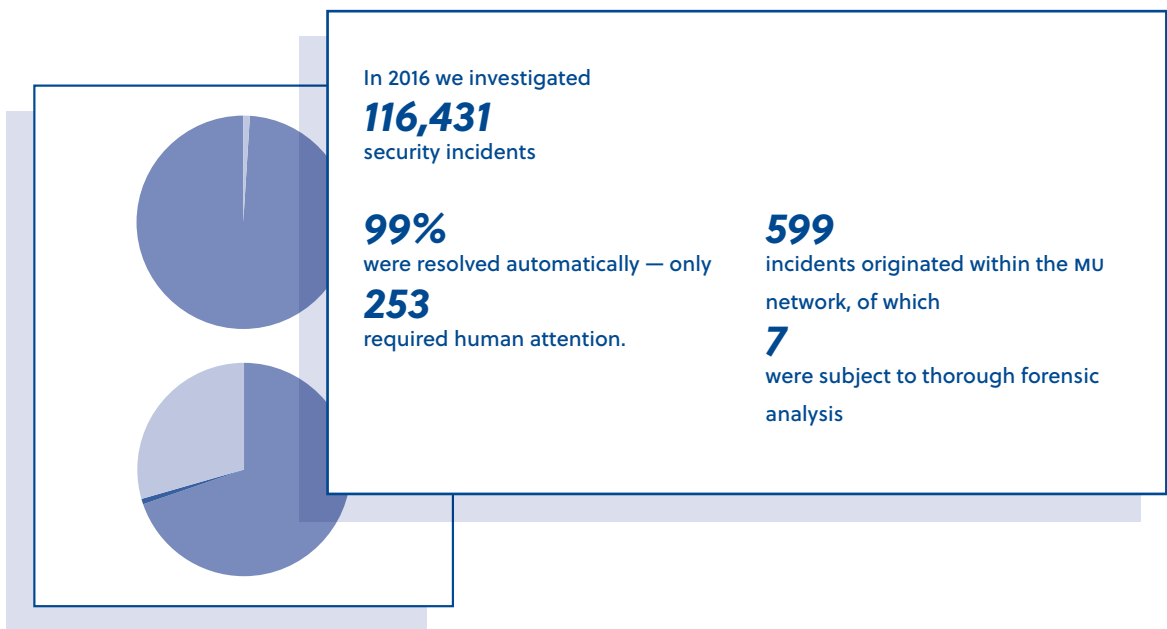
CYBERSECURITY

Award of the Trusted Introducer Certificate to CSIRT-MU

The Computer Security Incident Response Team of Masaryk University (CSIRT-MU) was the first security team in the Czech Republic to be certified by Trusted Introducer on 5 December 2016. Trusted Introducer brings together security teams from around Europe to facilitate collaboration on a more effective basis. Award of the certificate is conditioned upon fulfilling 45 demanding criteria in the areas of organization, processes, tools, and team members, and represents the highest level in the field. The award of the certificate to the CSIRT-MU thus boosts its visibility and reputation on the international stage and brings new possibilities for collaboration.

International Collaboration

CSIRT-MU contributed significantly to the direction taken by European security teams by promoting a new criterion for the Trusted Introducer security team accreditation. This criterion obliges accredited and certified teams to participate regularly in communication tests intended to find out whether

In 2016 we investigated
116,431
security incidents

99%
were resolved automatically — only
253
required human attention.

599
incidents originated within the MU network, of which
7
were subject to thorough forensic analysis

Security trainings and events presented in the
KYPO — Cyber Exercise & Research Platform
were attended by
228
people, of whom
68
took part in training events and
160
in training courses

a particular team reacts in a timely manner to reports and email requests. If they do not, the team may lose its accreditation. The anticipated benefit is in setting up a basic communication standard and identifying teams claim a level of services they fail to deliver in practice.

Security trainings and courses in the KYPO — Cyber Exercise & Research Platform

Cyber Czech is a regularly scheduled, unique security training event that utilizes technological and other means to train the capability of defending against simulated cyberattacks. These training events are jointly organized by MU and the National Security Authority in the isolated environment of the KYPO — Cyber Exercise & Research Platform. In 2016, we organized three training events during which participants acquainted themselves with current threats, how they are carried out, options for resolving them, and preventative measures. Other events organized in the KYPO — Cyber Exercise & Research Platform include small-scale security training courses that thematically target selected security areas, with an emphasis on practicing the skills being acquired. A training course of this type in March 2016 was attended by Czech Prime Minister Bohuslav Sobotka as part of his visit to the National Cyber Security Centre in Brno.

Knowledge sharing at Security MUST Week

Eighteen IT specialists from universities abroad took part in the week-long April training course MUST WEEK (Masaryk University Staff Training Week) in which we targeted IT security. The event aimed at sharing best practices among people with similar professional backgrounds and university experience and also provided an opportunity to discuss individual topics at a depth that extended right down to the technical level.

Penetration testing

As part of CSIRT-MU's expansion of its service portfolio, the team began to proactively examine the security of the MU IT infrastructure by performing penetration testing on selected services. The testing is done long-term and utilizes professional tools as well as the expertise of team members. The tests always lead to an increased security level for the services tested. They therefore seem to be well-suited to ensuring better security for the IT services MU provides.

Perun: an administrative system for computational resources

Masaryk University, together with CESNET, is developing Perun, a system for user identity and access management. It is unique in having the ability to manage not only existing users within an organization, but external users as well. Perun was designed to be launched in existing environments, where it offers a unified view of users and services that may then be used to control their access. It thereby supports the entire user life cycle. The launch of Perun at MU has streamlined and clarified access to services. Service administrators make use of a single location to verify access rights, and users may automatically access all services for which they possess access rights.

CSIRT-MU Projects

KYPO II—Simulation, detection, and mitigation of cyber threats endangering critical infrastructure
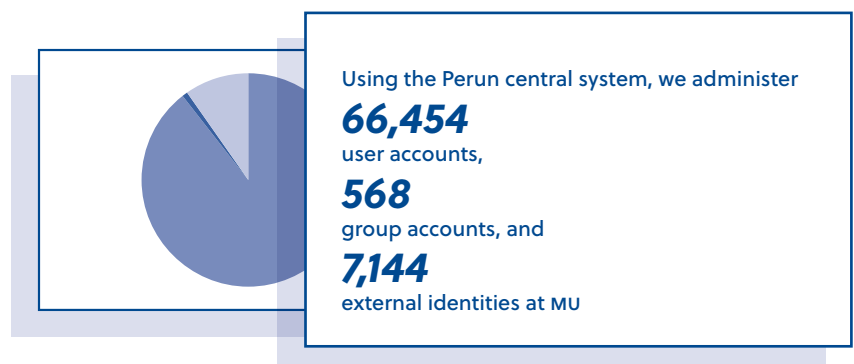
This project focuses on the research and development of tools for the costly, time-effective simulation of real-life critical information infrastructures (CII), the detection of new cyber threats, and the mitigation of their unfavourable impact on CII.

SABU—Sharing and analysis of security events in the Czech Republic

Working with CESNET, we developed a system to share and analyze security events, with the aim of raising the awareness of the current security situation in the Czech Republic and addressing large-scale security issues. In 2016, we focused on data normalisation, aggregation, and correlation, including opportunities for the use of advanced data mining methods.

Security Cloud—Technology for the processing and analysis of big network data

Together with Flowmon Networks and CESNET, we have designed bleeding-edge technology that analyzes network data at approximately 100 million records per second. It includes Stream4Flow, an open source tool developed by members of the CSIRT-MU that is intended for real-time network flow analysis. The tool allows rapid prototyping of detection methods and can provide information on what goes on in the network even at the level of individual devices. The system provides a current overview of network activity and makes it easier to address security incidents.

Using the Perun central system, we administer

66,454
user accounts,

568
group accounts, and

7,144
external identities at MU

TOP-LEVEL E-INFRASTRUCTURE

WHAT WE DO

→ Provide comprehensive administration of the backbone computer network and other networks at selected locations

→ Administer the university's telephone network

→ Provide support for computational servers, data storage facilities, and application add-ons

→ Integrate similar systems owned by other university units

→ Offer custom infrastructure solutions requested by significant user groups

KEY EVENTS IN 2016

→ Restored elements in the university's network infrastructure and gradually transitioned to a speed of 3 × 40Gbps

→ Acquisition of components that support the new generation of networking (SDN/OpenFlow) and preparation of a pilot installation

→ Launch of a new-generation cloud environment at MU

→ Significantly increased the resiliency of the voice network against outages

→ Boosted storage capacity for user data and the back-up system

UNIVERSITY DATA NETWORK AND OPTICAL INFRASTRUCTURE

Like the electrical grid, functional network infrastructure is an integral part of university life. ICS is the long-term operator and developer of the university's fixed and wireless infrastructure.

In 2016, we boosted the backbone network and increased its speed from 10 Gbps to 3 × 40. Furthermore, the components we acquired allow for SDN/OpenFlow to be used in the future. This technology represents a new approach to computer networks and aims to better their flexibility and simplify their administration.

Additional key activities in 2016:

➔ We continued to gradually regenerate and expand the university's wireless infrastructure—Eduroam, in particular—which we supported by acquiring and installing new control elements.
➔ We expanded the parallel technology network to include other locations.
➔ We consolidated security network probes in our central server rooms to more effectively monitor network activity and detect security incidents in time
➔ To increase the robustness of network infrastructure, we hooked up independent optical connection for some locations, including the Faculty of Law and the Faculty of Social Studies.
➔ We renewed network elements in the central infrastructure, specifically in the ICS computer room and UKB.

We administer

| **441**	**21,800**	**955**
routers and switches	end sockets	Wifi access points
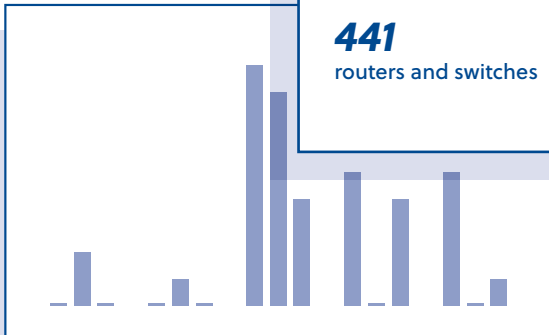
COMMUNICATION INFRASTRUCTURE

We reinforced the ease of access of the central telephone infrastructure

In July 2016, we finished migrating the control systems of the MU central telephone exchange to the MU central virtual infrastructure operated by the ICS. Compared to the former architecture, the migration will resistance will result in greater resilience in the face of outages for central components. The current architecture comprises three host servers and two disc fields connected via a SAN network, which ensures the continued online availability of control systems if any host server or disk repository goes down. This fully protects the telephone exchange against the outage of any one central element.

We administer a total of
5,400
fixed land lines

We administer
1,240
mobile telephone
numbers
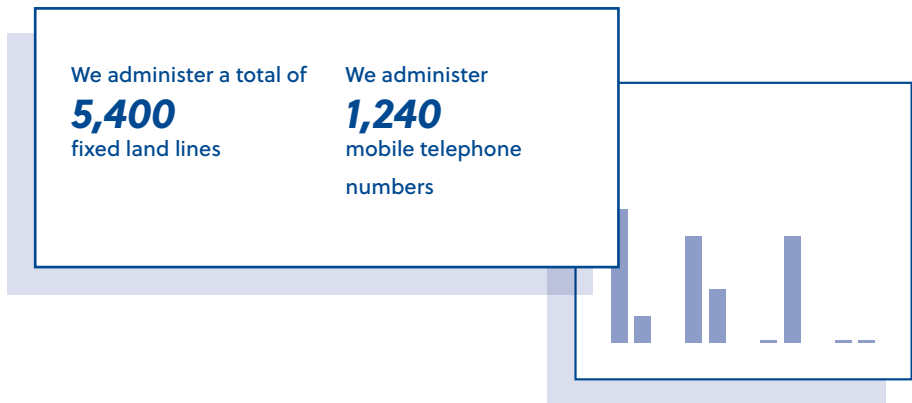
COMPUTATIONAL INFRASTRUCTURE

All servers designated for high performance computing are administer by the CERIT-SC Centre. Most were acquired during the prior period under the OP RDI project.

Three basic categories of servers are available for various types of calculations:

➜ HD (High Density) clusters with 8—20 cores on a single node and memory of 98 to 128 GB. These support the needs of applications with limited internal parallelism, which make use of a large number of concurrently running installations. Some nodes feature GPU cards.

➜ SMP (Symmetric Multiprocessing) clusters with 40—80 cores on a single node and shared memory of up to 1.3 TB, oriented to applications with extensive memory demands or that require a large number of processor cores — currently up to 384. Suitable for highly parallel tasks or applications that are extremely demanding of memory.
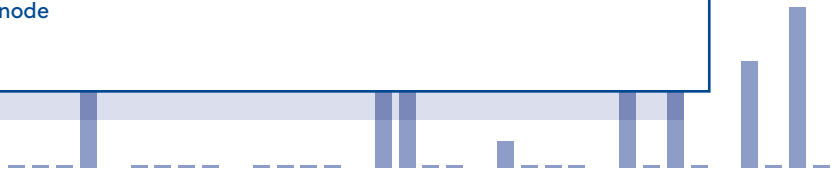
CERIT-Scientific Cloud includes

5,144
CPU cores

4 PB
of disc space available for
user data

96 GB up to 6 TB RAM
on a single computing node

Operation of virtual servers with high availability demands

This environment based on VMWARE vSphere technology emphasizes stability of operation. It is suited to critical production services such as mail servers, key websites of university units, information systems, authentication and file servers, etc. Total platform capacity is purposely restricted, and the relatively expensive VMWARE licences are used only in justified cases.

Launching a new generation of cloud environment at MU

In December 2016, we launched pilot operation of a new cloud environment at MU that was built using OpenStack. Its main benefit lies in its high degree of self-service. Users independently create and kill virtual servers as well as comprehensive software-defined environments consisting of server groups, storages, and virtual network environments. For instance, a virtual classroom may be created, or several test versions of a web application or information system may be easily put together before being launched into live operation.
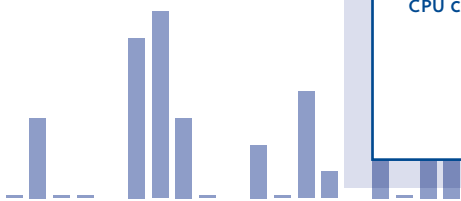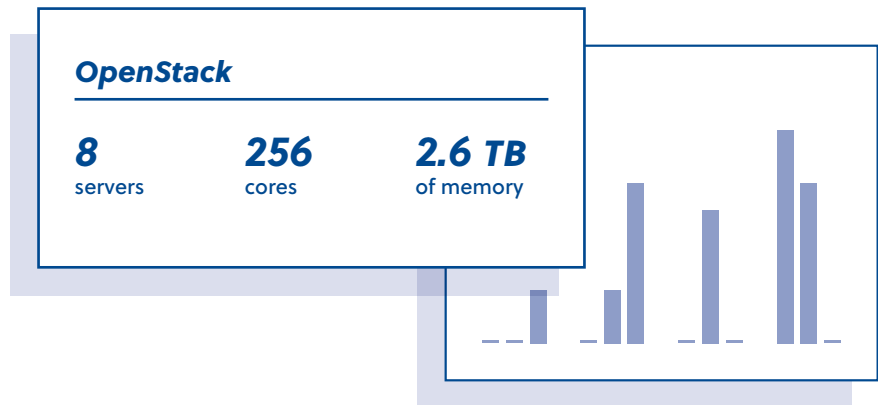
VMware vSphere

16
servers

3.7 TB
of memory

348
CPU cores

622
virtual machines
hosted using the
infrastructure

OpenStack

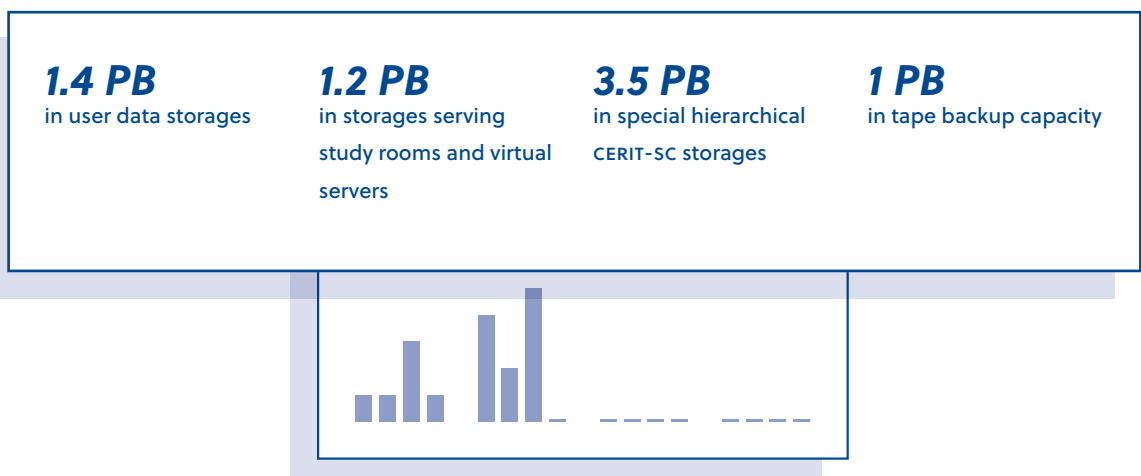| *8*	*256*	*2.6 TB*
servers	cores	of memory

STORAGE INFRASTRUCTURE

The Institute of Computer Science offers and arranges data storage options. The storages available have a total capacity exceeding 7 PB.
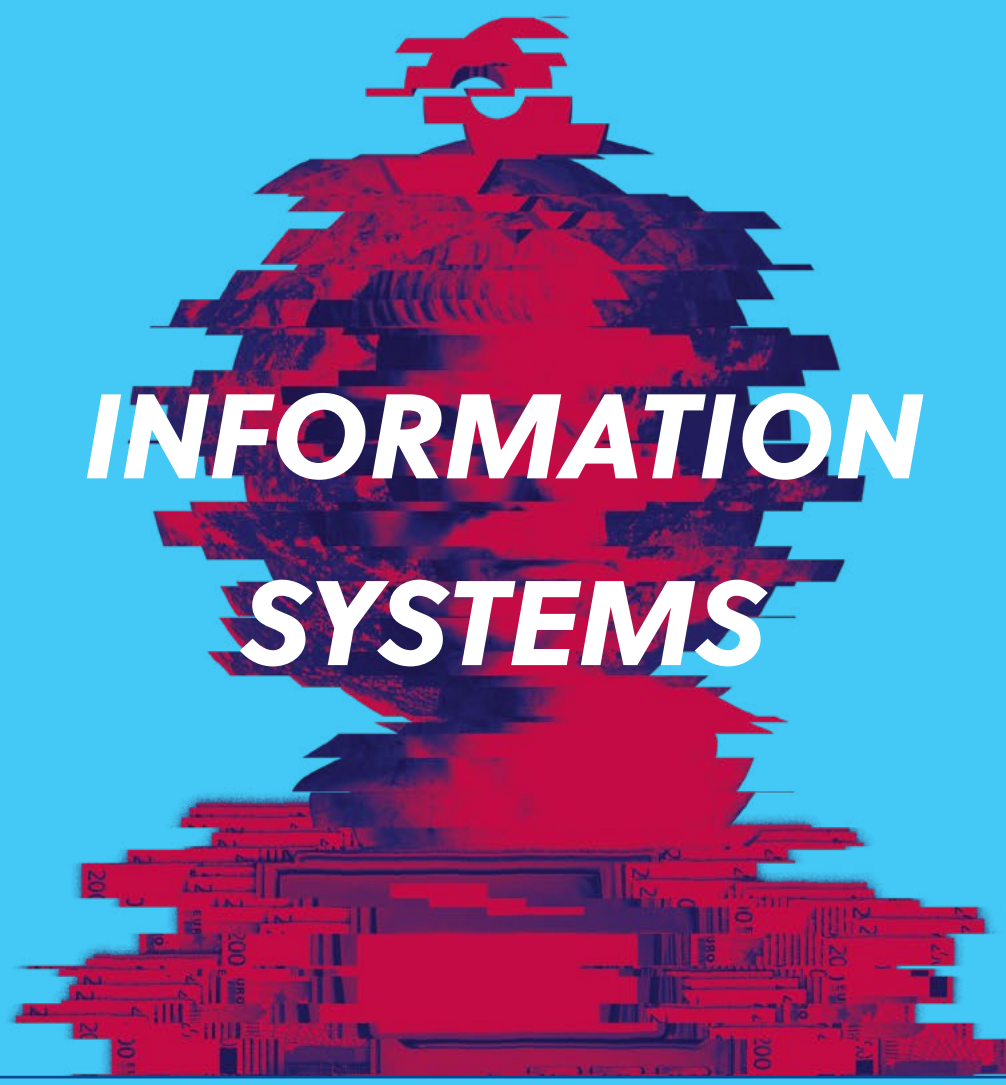
Individual options vary in terms of available capacity, speed, reliability, data access methods, and mode of administration. This provides users access to a variety of storages for everyday work with data, ranging from extensive experimental applications and simulation results to regular documents and tables, and for the sharing and archiving of outputs.

These servers also have the storage capacity needed to store images generated by running virtual machines and active work data. The storages possess internal redundancy: even the concurrent failure of a number of discs will not cause data loss or operational outages. Critical data continue to be stored using tape systems.

In 2016, we replaced our tape backup system with a new, higher-capacity system built on open source software, thereby sidestepping limitations imposed by the cost of purchasing expensive licenses.

1.4 PB	*1.2 PB*	*3.5 PB*	*1 PB*
in user data storages	in storages serving study rooms and virtual servers	in special hierarchical CERIT-SC storages	in tape backup capacity

INFORMATION SYSTEMS

WHAT WE DO

- → Run the Magion economic information system
- → Run the INET economic and administrative intranet
- → Oversee map applications and the web-based Kompas GIS
- → Oversee the Union Register of University Students and other information systems of the Ministry of Education, Youth and Sports

KEY EVENTS IN 2016

- → Joint project for Magion, IFIS and SAP economic system users
- → Changes to the Magion system to reflect changes in the law
- → Launch of Magion at ZCU Pilsen
- → Systematic translation of key INET agendas
- → Electronic processes for asset administration and HR in INET
- → Munimap, the map library
- → Operation and development of MEYS systems and meeting the requirements of the amended Act on Institutions of Higher Education

THE UNIVERSITY ECONOMIC AND ADMINISTRATIVE INFORMATION SYSTEM

A duo of closely interconnected subsystems provides comprehensive support for the university administration and for finance, HR, and operational activities: EIS Magion—externally provided by Magion Systems, a.s. — and INET MU, developed in-house at the Institute of Computer Science. In addition, there is a new geographic information system, (GIS) Kompas, also developed by the Institute, to provide further assistance with asset administration.

→ EIS Magion is used by almost eight-hundred users in the university's finance and HR offices. It offers financial, asset, and HR-Wage modules.

→ INET targets tens of thousands users from around the university. It's built on Magion, significantly supplementing and expanding its functions, and it also covers science, research, and operating services.

→ Kompas is designed to serve employees of operating units and those in charge of facility management, and targets fixed assets and technology.

EIS Magion

Seven universities in the MagNet network, coordinated by Masaryk University, collaborate on the development of Magion. Since 2015, the network has been collaborating closely with twelve other universities operating the iFIS economic system. In 2016, another six universities operating SAP joined these efforts. MU participates in inter-university collaboration via EUNIS CR. The university has representatives on the association's executive committee and is responsible for EIS.

New functions were added to Magion in response to changes in the law and to requirements dictated by university operations. In particular, key changes were made in the Registry of Contracts and Orders in the form of comprehensive modifications to accommodate the new national Registry of Contracts, including interconnection to the MU Internal Contract Registry. It will now be possible to analyze financial models in a way that conforms to the newly introduced electronic recordkeeping requirements for revenues. The storage model was also reworked to satisfy the operating needs of the

In 2016

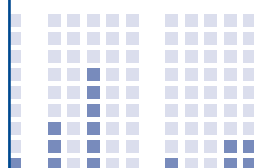**741**
users actively
utilized EIS Magion

30,600
users actively
utilized INET and

1,022
users actively
utilized Kompas.

university's e-shop. Further modifications were made to the calculation of write-offs and VAT settlement in the Assets module. Also, individual modifications made to the FR and Wage modules, such as support for reporting on projects implemented under OP Employment and OP Research, Development and Education.

INET

In 2016, INET came into use outside MU — it was launched into pilot operation at the University of West Bohemia in Pilsen, where self-sustained sets of the FR and Wage modules began to be utilized.

We also continued to systematically translate the key applications with the broadest user base, as well as applications that serve university management at all levels.

The digitization of processes targeted asset administration and HR, and brought the following changes:

➜ removal from inventory of assets localized for individual finance units, now including mass processes
➜ confirmation of inventory lists of assets
➜ university-wide leave scheduling
➜ collection and approval of Teaching Work Agreements
➜ automatic transfer of annual employee evaluations from EVAK to HR
➜ interconnection of HR and registers of health insurance companies
➜ approval of project time sheets and time sheet signatures using RemSig (personal digital certificates)
➜ interconnection between travel authorization forms and driver training
➜ modifications to DNS requests and framework contracts related to the national Registry
➜ of Contracts, and adding the option to personally require such a request be issued

INET Helpdesk

User requests related to the HR, finance, and operations areas are processed using a special Helpdesk application in INET and ihelp@ics.muni.cz. In 2016, we took in a total of 2697 requests.

Category	Requests
HR	~530
Magion	~380
DNS and framework contracts	~340
SUPO	~280
Finance	~210
Research and development (ISEP)	~185
Contacts	~115
Other	~665

INET

750,000
documents saved

Assets

266,000
Inventoried items

70,000
sw licenses

SUPO — Cashless Payment System

CZK 140,000,000
turnover

Jobs.MU

1,700
e-applications (82% of all applications)

Asset Management and GIS

→ The GIS Kompas website was built on the ESRI platform and is designed for operations and facility management employees to search fixed assets and technology using 3D visualization.

→ In addition to Kompas, the data is also used in INET, IS, www.muni.cz, and other public website presentations. The data is presented via a map component that was developed in-house in 2016. It was made available to the public under the name 'munimap'. Detailed documentation is available at muni.cz/mapa with no login requirements.

→ Kompas, munimap, other specialized map applications, and geospace data are available at MU Geoportal, a common university-wide gateway located at geoportal.muni.cz

MEYS INFORMATION SYSTEMS AND COLLABORATION WITH IHIS

In 2016, we submitted the winning bid for a Ministry of Education, Youth and Sports tender, obtaining a two-year contract from June 2016 to June 2018 for the operation and development of seven information systems at the MEYS Department of Higher Education:

→   SIMS — University Student Registry
→   REDOP — Registry of Deans and Professors
→   PPSVS — Assessment of University Studies Abroad
→   ISACC — IS Accreditation Committee
→   NVS — Register of Applications for Recognition of University Education Obtained Abroad (nostrification)
→   UOK — Recognition of Professional Qualifications
→   RUV — Registry of Arts Outputs

In the second half of 2016, these systems were developed in line with the spirit of the amended Act on Institutions of Higher Education.

Furthermore, we concluded a Collaboration Agreement with the Institute of Health Information and Statistics of the Czech Republic to work together on developing national health registries.

MEYS Systems

These systems are used by
3,060
active users and
68
universities
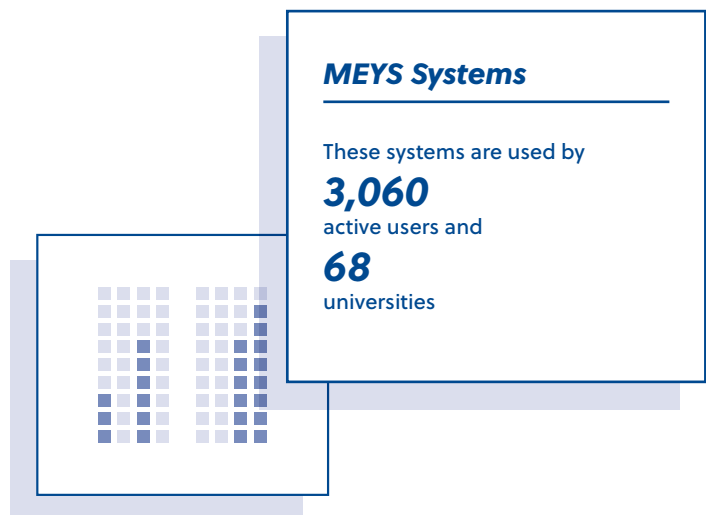
OPEN DIGITAL SCIENCE

WHAT WE DO

→ Coordinate the growth of the university library network via the MU Library Information Centre (KIC MU)

→ Operate and utilize the university-wide Aleph-MU library system

→ Acquire electronic information resources (EIZ) for research, development, and education at the university

→ Create technology to make EIZ accessible and easy to use

→ Digitize and create digital libraries

→ Coordinate library projects and consortia

KEY EVENTS IN 2016

→ Strategic library plan for 2017—2020

→ Collaboration on the draft plan of the CzechELiv project

→ Identification of key EIZs for MU

→ Helping to create the national Open Access policy

→ Digital library development

→ Initiation of the NAKI-ArcLib project

MU LIBRARY STRATEGY

In line with the university's long-term plan, libraries prepared a 2017—2020 strategic development plan that has been approved by university management. The plan targets greater support for research and development provided by libraries, providing long-term access to key electronic information resources, librarian education, and the development of up-to-date library services and technology.

The Coordinated MU Library System

15
major libraries
(8 central faculty
libraries, 2 special
libraries, and
5 library outlets)

1,645,000
physical library units in
MU library funds

41,757
annual increase in
physical library units

LONG-TERM ACCESS TO ELECTRONIC INFORMATION RESOURCES FOR RESEARCH AND DEVELOPMENT

Masaryk University possesses current access to the best academic information on a level fully comparable to that of developed countries. MU users may thus enjoy more than a hundred of extensive EIZ packets from all fields of study offered at the university. Three-quarters of the total cost, estimated at approximately CZK 50 million per year, is covered by EIZ projects, but these will terminate at the end of 2017. To ensure access to academic information for the upcoming period, KIS MU has had to address three key areas:

➜ We took an active part in the CzechELib system project investigated under OP RDI, and the EIZ concept for the national centre, established as part of the Czech National Library of Technology as of 1 January 2017. The CzechELib centre will provide long-term access to EIZs for the entire Czech academic sphere starting in 2018 and contribute up to 50% of the funding.
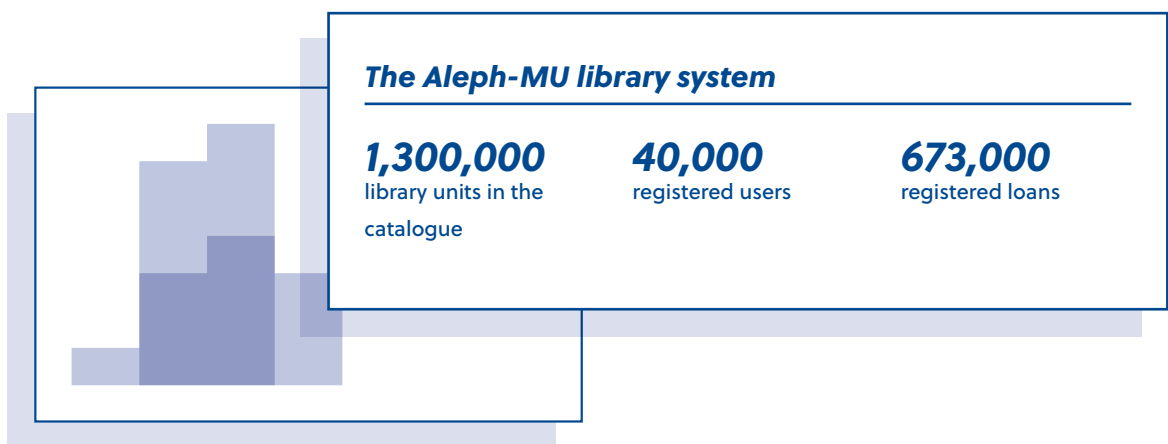
→ We initiated and coordinated a broad-ranging discussion at MU to define key EIZs for the University's needs after 2017, as well as to determine a system of sustainable funding.

→ We hosted negotiations to ensure mandatory sustainability for EIZs during the two-year period from 2018 to 2019 under OP R&DfI. The university participates in 8 projects that have provided MU full funding for EIZs related to STM (Science-Technology-Medicine) during the 2013-17 period; the total subsidy received by MU during this period amounts to CZK 134 million. For the 2018-19 period, by contrast, MU must fund these EIZs itself, which will require an expenditure of approximately CZK 26 million per year.

PREPARATION OF AN OPEN ACCESS NATIONAL POLICY

We took an active part in preparing the CR for Open Access as part of a working group led by the Technology Center at CAS. Using the background materials we prepared, the Department of the Office of the Deputy Prime Minister for Science, Research and Innovation prepared the final draft of the "Czech National Strategy for Open Access to Academic Information for the 2017—20 period".

The Aleph-MU library system

1,300,000
library units in the catalogue

40,000
registered users

673,000
registered loans

LONG-TERM ARCHIVAL OF DIGITAL DOCUMENTS

In 2016, working with CZS, the National Library of the Czech Republic, and the Moravian Library in Brno, we began work on the five-year ArcLib project, part of which will include a system supporting the long-term storage of digital library and archive collections.

The system will employ available open-source tools and systems, among them the Archivematica tested at ICS MU.

DIGITAL LIBRARY DEVELOPMENT

Utilizing technology developed at ICS MU, we operate and develop a number of digital libraries that serve both the university and the national academic community.

Chief among them are the Czech Digital Mathematical Library DML-CZ, the Digital Library of the Faculty of Arts of MU, the Digital Library of the MU Faculty of Law, the MU Digital Photograph Library, and e-prezenčka, a system for digitizing and accessing rare texts.

All these systems significantly expanded the volume of information offered to users in 2016. For instance, the DML-CZ library was expanded to include a total of 37,000 articles by 16,000 authors, freely available under the Open Access regime.

Electronic information resources (EZIs)

116
packets of licensed EZIs
(subscriptions or permanent
purchases)

23,500
e-magazines

175,000
e-books

The discovery.muni.cz search service

260,000
connections

486,000
unique searches

Digital Libraries

5
Digital library systems (e-prezenčka, the MU Digital Library of Photographs DKF-MU, Czech Digital Mathematical Library DML-CZ, Digital Library of the Faculty of Arts, MU, and Digital Library of the Faculty of Law, MU)

E-prezenčka:

11,800
digitized books

DKF-MU:

56,000
photographs in
31
collections

DML-CZ:

37,000
articles by
15,800
authors

DK-FF

30,000
documents by
6,700
authors

UNIVERSITY WEBSITES

WHAT WE DO

→ Develop and operate Umbraco, the university-wide editing system

→ Develop a website and newsletter builder to support MU's unified online image

→ Create and administer websites built using the builder (the university, faculties, departments, units, conferences, projects, and other activities)

→ Customize websites and website components

KEY EVENTS IN 2016

→ Development of MuniWeb, the university website builder

→ Development of a university newsletter builder

→ Development of an environment for creative work by users, sending of newsletters

→ Implementation of a new version of www.muni.cz in MuniWeb

→ Implementation of dozens of website presentations and components

MUNIWEB

Working with the MU Rector's Office and third parties in 2016, we created a universal website builder for MU based upon MU's new visual identity, featuring dozens of graphic and data components. We implemented it in Umbraco, and it's currently available to all MU faculties and units.

WWW.MUNI.CZ AND FACULTY WEBSITES

In November 2016, we launched a new version of www.muni.cz implemented in MuniWeb. Concurrently, we started working on a new website for the MU Faculty of Arts, including several dozen website presentations for departments and units.

UNIVERSAL NEWSLETTER BUILDER

Together with the MU Press Office and the Rector's Office, we created a universal newsletter builder featuring several graphic components to be used at MU. Just like MuniWeb, it was implemented in Umbraco and is available to all university units.

We used the environment to create and send a new Newsletter for MU employees and a new Newsletter for MU alumni.

260
Umbraco users

54
new websites, including www.muni.cz

30
configurable MuniWeb components

158
websites running
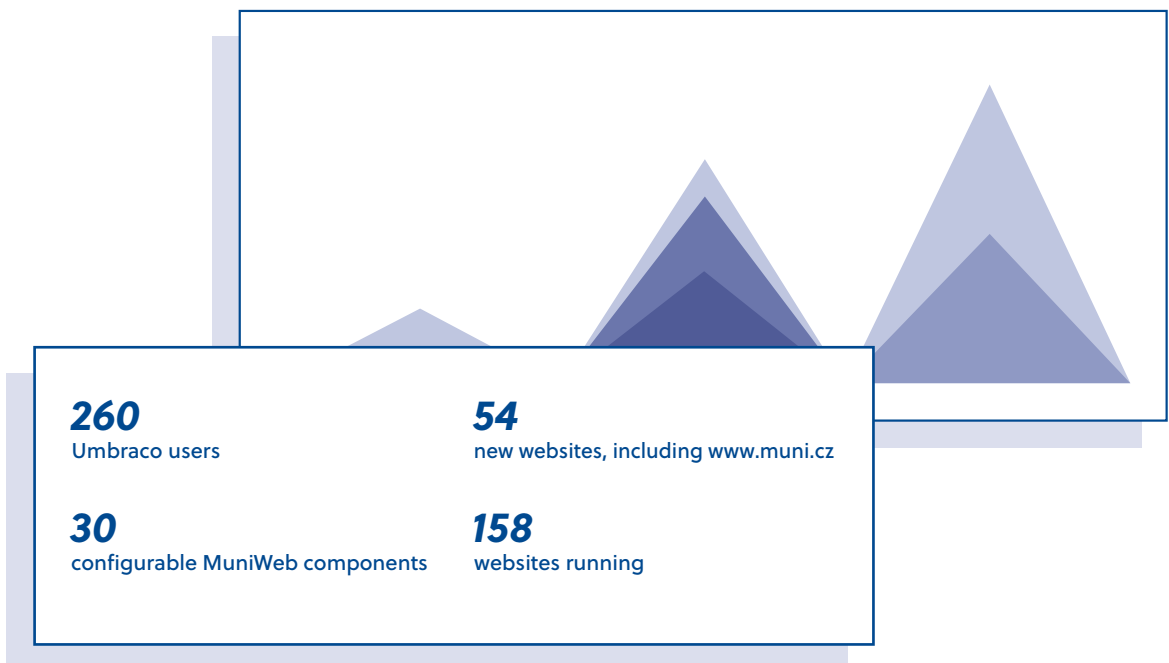
OTHER IMPORTANT WEBSITES

➜ Working with a third-party agency, we put together a new version of the presentation section of the JobChallenge trade fair website.

➜ We created sablony.muni.cz to present the unified MU visual style.

WEBSITE DESIGN AND CREATION

➜ Services provided by the web centre at the Institute of Computer Science were expanded and now include assistance in designing the structure and content of new websites.

www.muni.cz

3,160,000
visits

14,000,000
pages displayed
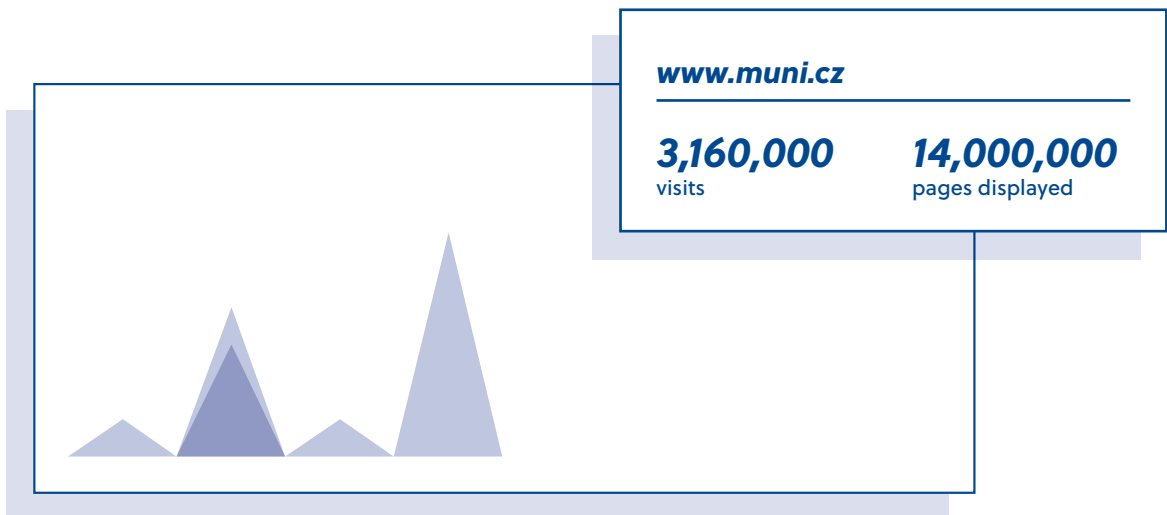
STUDY AND PRACTICAL EXPERIENCE

WHAT WE DO

We work with and provide specific IT services for students:

→ Operate the university Computer Room and other computer rooms, including printing services

→ Offer WiFi internet connections via the Eduroam and Muni networks

→ Offer access to electronic information resources

→ Administer library loans and book search in university libraries

→ Issue university SW licenses

→ Operate the housing website bydleni.muni.cz

→ Take ID photographs and issue ID cards

→ Administer SUPO accounts and payments via ISIC

→ Supervise bachelors and masters theses and dissertations

→ Oversee student participation in research projects and regular IT operations

KEY EVENTS IN 2016

→ Student printing system updated

→ English language environment installed on PCs located in study rooms

→ Software licenses to support study issued, including Office 365

STUDENT PRINTING SYSTEM IMPROVED

In 2016, we improved the student printing system at the university. The update allows printing from mobile devices and email without need of an ISIC card. Students may now also have documents printed at any location, regardless of where the printing task was sent from.

E-TEACHING PROJECT FOR THE FACULTY OF ARTS

Working with the MU Faculty of Arts, we created a system for publishing video lectures recorded in the faculty's classrooms as well as on mobile devices. It also allows the videos to be archived. The system is also connected to MOODLE, the faculty e-learning system. In November 2016, we launched pilot operation of the system, and at the start of the spring semester in 2017, we are planning live operation with active use of video recordings during instruction.

We centrally administer
1,319
student computers, that's 76 more than last year

In 2016,
11,000
students used services available in the University Computer Centre
279,000
times

Overall, in 2016, the services of all PC study rooms were used by
44,000
users who logged in
606,000
times

Students printed
478,000
pages in the Centre of the total
1,551,000
pages printed in all faculties

UNIVERSITY COMPUTER CENTRE NEWS

The growing number of mobile devices has partially reduced student interest in working on traditional PCs. In conjunction with this trend, the University Computer Centre has become a meeting point for informal gatherings and collective work. How have we reacted?

→ The growing number of mobile devices has partially reduced student interest in working on traditional PCs. In conjunction with this trend, the University Computer Centre has become a meeting point for informal gatherings and collective work. How have we reacted?

→ After analyzing student needs, we came up with a plan that would modify the existing space to create work zones. The zones make room for these alternative uses without impacting the quiet of the Centre's study zones.

→ We created an application enjoyed particularly by foreign students that allows them to switch the entire Windows operating system to English. This application is available in other study rooms, as well.

An overview of PCs in MU computer labs managed by the ICS

University Campus Bohunice	*218 PCs*
→ Chemistry classrooms:	25 PCs
→ Computer rooms:	78 PCs
→ Library:	115 PCs

Faculty of Science	*150 PCs*
→ Kotlářská 2 — classrooms:	57 PCs
→ Study halls:	93 PCs

Faculty of Law	*109 PCs*
→ Veveří 70 — study halls:	24 PCs
→ Classrooms:	85 PCs

Faculty of Education	*144 PCs*
→ Poříčí 31 — classrooms:	87 PCs
→ Library:	57 PCs

Vinařská Halls of Residence	*3 PCs*
→ Study halls:	3 PCs

Komenského náměstí	*186 PCs*
→ University Computer Centre:	128 PCs
→ Teiresiás:	58 PCs

Faculty of Arts	*342 PCs*
→ Arna Nováka 1 — library:	113 PCs
→ Veveří 26 — classrooms:	31 PCs
→ Gorkého 7 — classrooms:	53 PCs
→ Gorkého 14 — classrooms:	45 PCs
→ Janáčkovo náměstí — classrooms:	15 PCs

Faculty of Social Studies	*91 PCs*
→ Joštova 10 — classrooms:	54 PCs
→ Study halls:	24 PCs
→ Library:	13 PCs

Telč	*76 PCs*
→ Classrooms:	76 PCs

➜ We optimized the furnishings in study rooms to support our new printing technology and to better accommodate the actual use of the rooms and needs at individual locations. We reduced the number of machines from 53 to 39 and acquired 15 new multifunctional printers.

COLLABORATION WITH STUDENTS

A masters thesis focused on the basics of successful security training involved both a game and a research project that contribute to cybersecurity education

The non-traditional security game was created by the student to teach penetration testing within the environment of the Cybernetic Polygon. Practical instruction in the form of a game attracts newcomers to the field at the same time it hones the skills of professionals. Testimony to the game's popularity is the positive feedback given by participants in the training sessions, who hail from various organisations located both here and abroad. Results of the masters thesis have also been used to study 'active instruction', whose goal is to tailor instructions to the knowledge and skills possessed by individual participants. The thesis project enhanced instructional games by recording participant interactions within the Cybernetic Polygon. Analysis of the data generated will allow the effective use of new instructional modules.

Involvement of ICS employees in university instruction and supervision of final theses

A total of
30
ICS employees taught
84
subjects

ICS employees supervised
133
final theses, and served as
opponents for
57
theses.
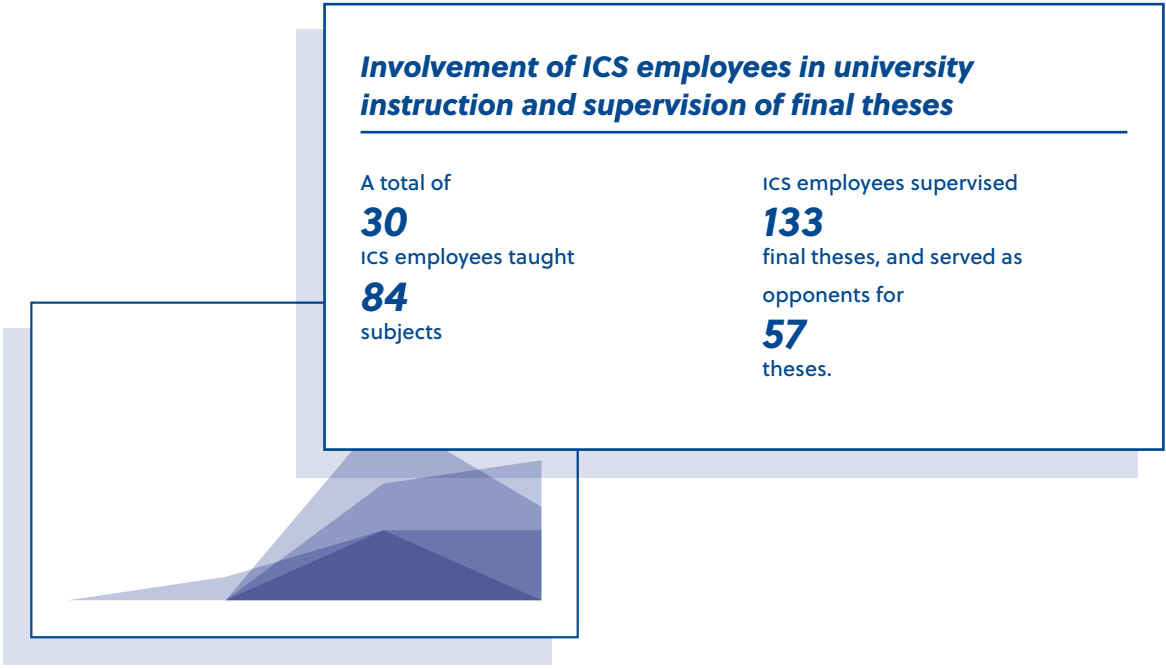
Research for a masters thesis allows quicker spotting of network attacks

In this masters thesis, the student investigated the use of a new data visualization technique, so-called 'datastream processing', to analyze network activity from a security standpoint. The software created is capable of real-time processing of data from a fully loaded 10Gb/s line, thereby demonstrating its potential for use in high-speed network environments. The method optimized by the student reveals network attacks that try to gain remote access to a computer's graphic interface. Its detection abilities were compared to those of the current solution, which makes use of an older method of batch data processing. The use of stream processing speeded detection by more than 180 seconds on average. The success of this masters thesis motivated the student to enroll in the doctoral program and to participate in the Brno PhD Talent contest, in which won out over many excellent candidates, was awarded a prestigious prize, and received financial support for further research.

FINANCE, HR,
PROJECTS, AND
COLLABORATION

ICS Employee structure

	Elementary education	Secondary education	Bachelors degree	Masters degree	PhD
Manual workers	3				
Specialized workers		17	6	55	7
Professionals				9	13
Administrative workers		6	1	20	1
Assoc. Prof.					3
Professors					1

ICS MU Income

(in CZK*)

Non-investment activity	2012	2013	2014	2015	2016
Educational activity 1111/2112	93,350,000	96,197,000	96,197,000	96,997,000	96,500,000
Educational activity CF 1112[1]	21,840,000	32,791,000	35,833,000	41,093,000	42,715,000
R&D institutional funding	457,000	1,241,000	1,506,000	1,977,000	2,612,000
Total	115,647,000	130,229,000	133,536,000	140,067,000	141,827,000
Total non-investment budget of ICS[2]	229,083,000	251,192,000	289,838,000	294,285,000	271,225,000
Total ICS employees[3]	144	132	142	130	126
number paid from 1111	96	93	95	102	102

Non-investment income	2012	2013	2014	2015	2016
Projects and instrumental funds, including FISP	78,400,000	124,500,000	61,400,000	42,453,000	38,135,000
Economic activity	27,680,000	27,415,000	26,970,000	23,737,000	26,859,000
Total	106,080,000	151,915,000	88,370,000	66,190,000	64,994,000

Investments: from funding, IDP and FRFA	2012	2013	2014	2015	2016
Buildings, networks, easements	7,300,000	5,000,000	5,000,000	5,318,000	4,852,000
Software, licenses, machines, equipment	16,500,000	29,170,000	46,170,000	39,064,000	28,225,000
Total	23,800,000	34,170,000	51,170,000	44,382,000	33,077,000
ICS net income	2,786,000	3,822,000	4,513,000	2,994,000	4,963,000

1 CF does not include payroll expenses
2 including write-offs
3 on average

Public contracts — ICS MU 2016

Type of contract		(in CZK*)
Open call, above-threshold	0	0
Open call, sub-threshold	1	2,709,000
Sub-threshold, SSP	6	20,869,000
Small-scale public contracts	17	17,871,000
Total	**24**	**41,449,000**

ICS MU grants in 2016

National grants	MEYS: VI	MEYS: FP7	MEYS: CRP	MEYS: EUREKA	CSF	TACR	MC	MI	Various[1]	Total	Amount awarded (in CZK*)
Total	2	1	1	3	1	2	2	2	1	15	29,177,000

Foreign grants	EU: CIP		EU: FP7		EU: H2020		EU: other				
Number		1		1		2		2	6	8,958,000
Total									21	38,135,000

1   CSF, iRP, MU: Research support program

NAKI Ministry of Culture

➔   NAKI ARCLiB — comprehensive solution for long-term archival of digital (library) collections

Ministry of the Interior

➔   Simulation, detection, and suppression of cyber-threats endangering critical infrastructure
➔   Sharing and analysis of security incidents in the CR

MEYS Large Infrastructures

➔   ELIXIR-CZ VI

TACR ALFA

➔   Technology to process and analyze big network data
➔   Platform to provide specialized meteorological predictions for the energy sector

CSF Standard Project

➔   Simulation of comprehensive systems with enhanced patterning

EUREKA CZ MEYS

➔   Building as a service
➔   Autonomous system of spatial routing for mobile connections
➔   Advanced Onboard Data Recording

EU:CIP — Competitiveness and Innovation

➔   SDI4Apps (Uptake of Open Geographic Information through Innovative Services Based on Linked Data)

EU: Other Community Programs

➔   Senter
➔   LIVE_FOR

EU: FP7 — 7ᵗʰ Framework Program

➔   Thalamoss

EU: Horizon 2020 — RIA

➔   ELIXIR-EXCELERATE
➔   West-Life

ORGANIZATIONAL STRUCTURE

Management
→ **prof. RNDr. Luděk Matyska, csc.,** Director
→ **Ing. Martin Veselý,** Vice-Director for Strategy and Services
→ **doc. Ing. Otto Dostál, csc.,** Vice-Director for Research and Development
→ **JUDr. Dana Šrubařová,** Bursar
→ **RNDr. Miroslav Bartošek, csc.,** Head of the Library and Information Cenre

→ **RNDr. Jana Kohoutková, Ph.D.,** Head of the Information Systems Division
→ **Mgr. Aleš Křenek, Ph.D.,** Head of the User Support Division
→ **Mgr. Kamil Malinka, Ph.D.,** Head of the Computational and Storage Infrastructure Division
→ **RNDr. Tomáš Rebok, Ph.D.,** Head of the Communication Infrastructure Division

Director's Council
→ prof. RNDr. Luděk Matyska, csc., Ing. Martin Veselý, doc. Ing. Otto Dostál, csc., JUDr. Dana Šrubařová, RNDr. Miroslav Bartošek, csc., RNDr. Jana Kohoutková, Ph.D., Mgr. Aleš Křenek, Ph.D., Mgr. Kamil Malinka, Ph.D., RNDr. Tomáš Rebok, Ph.D., Mgr. Břetislav Regner, Mgr. Michal Vičar

Academic Board
Chairman
→ **prof. RNDr. Luděk Matyska, csc.**

Internal members
→ **prof. Mgr. Jiří Damborský, Dr.**
→ **doc. Ing. Otto Dostál, csc.**
→ **doc. RNDr. Ladislav Dušek, Ph.D.**
→ **doc. RNDr. Petr Holub, Ph.D.**
→ **prof. RNDr. Michal Kozubek, Ph.D.**

External members
→ **prof. Ing. Václav Hlaváč, csc.** (FEL ČVUT, Prague)
→ **Ing. Martin Svoboda** (National Technical Library)
→ **prof. Ing. Ivo Vondrák, csc.** (VŠB-TU, Ostrava)

ICS management, Secretariat
→ CERIT-SC
→ C4e
→ Project Department

User Support Division
→ University Computer Centre
→ Technical Support Department
→ Proactive Support Department
→ Public Relations Department

Communication Infrastructure Division
→ Security Department
  → Incident Analysis Group
  → Network Traffic Analysis Group
  → CSIRT-MU Group
→ Collaborative Systems Department
→ Network Infrastructure Department

Computational and Storage Infrastructure Division
→ Server and Data Storage Administration Department
→ Systems Administration Department
→ Software Development Department

Information Systems Division
→ MU Library and Information Centre
→ Information Systems Administration
→ Information Systems Development

Operational and Economic Division
→ Financial and Administrative Office
→ Technical and Operational Office
→ Investment and Public Tender Office
→ Personnel and Wage Department

COLLABORATION BETWEEN ICS AND PARTNERS

Ministries and State Institutes

→ Ministry of Education, Youth and Sports
→ Ministry of Defense
→ Ministry of the Interior
→ National Security Authority
→ National Cyber Security Centre
→ Police of the Czech Republic
→ Institute of Health Information and Statistics of the CR

Professional institutions and organizations

→ CEITEC
→ CESNET
→ EUNIS-CZ National Association
→ ELIXIRE-CZ
→ GÉANT — TF-CSIRT
→ EGI
→ Various institutes of the Academy of Sciences of the Czech Republic
→ Masaryk Memorial Cancer Institute (MMCI)
→ Moravian Library

Commercial and industrial partners

→ ČEPS, a.s.
→ Flowmon Networks, a.s.
→ Magion system, a.s.
→ PragoDat, s.r.o Y Soft Corporation, a.s.
→ Mycroft Mind
→ SVS FEM s.r.o.
→ Comprimato Systems s.r.o.
→ SWC InTech s.r.o.

International Project Partners

→ University of Utrecht (NL)
→ Science and Technology Facility Council (UK)
→ Centro Nacional de Biotecnología (ES)
→ Instituto Nationale di Fisica Nucleare (IT)
→ University of Torino (IT)
→ EurOPDX (international consortium)