

IT Support for Research and Development



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■ „Standard IT“

Office worker

- Internet connection
- E-mail, web, Instant Messaging/VCF
- Office Apps (Text processor, Spreadsheet)
- Information System
- Computer (Windows/Mac/Linux) or Thin Client
- Data Volume – 100's of megabytes to several gigabytes
- Processor Load: none

■ Standard IT

Teacher: plus

- Presentation program
- Simple image processing
- video processing (maybe)
- E-learning system (maybe)
- SW for Interactive Whiteboard, Voting System
- Computer
- Data Volume: gigabytes, 10's of gigabytes
- Processor Load: low

■ Advanced IT

Graphic designer, Video Processing

- **Data Volume – maybe 100's of Gigabytes, several Terabytes**
- **Processor Load: sometimes high**



■ Home Computer

**Photos, Games, Home or Downloaded
Videos, Music**

- **Maybe 100's of gigabytes to several terabytes**
- **Processor Load: may be high**
- **Requirements for Home Computer are often higher, then for a Computer at Work**

■ What is so special on R&D?

?? Psychology, economy, pedagogy, history

Medicine and Natural Sciences



CEITEC



■ CEITEC

Central European Institute of Technology

- life sciences, advanced materials and technologies
- Basic and applied research, Center of Excellence
- Masaryk University, Brno University of Technology, Mendel University in Brno, University of Veterinary and Pharmaceutical Sciences in Brno, Veterinary Research Institute, Institute of Physics of Materials of the Academy of Sciences of the Czech Republic
- **MU: life sciences**



■ CEITEC: Themes

Structural Biology

Brain and Mind Research

Genomics and Proteomics of Plant Systems

Molecular medicine

Molecular Veterinary Medicine

**Advanced Nanotechnologies and
Microtechnologies**

Advanced Materials



■ Laboratory Devices

Flow cytometry

Microscopes

Magnetic resonance

Tomograph

Sequenator

Freezer

Fytotron



■ Scientist's requirements

Complex

Sometimes conflicting

■ Data Storage

Various Types of Data

- Documents (gigabytes)
- Fotos (10's of Gigabytes)
- Videos (100's of Gigabytes)
- Data from Sequenators – up to 50 TB/year
- Electron Microscope – up to 30 TB/year

- It is necessary to acquire, store, transfer, process and backup the data

■ Data Storage

Several Data Storage Systems

- Standard
- Middle
- BIG
- Cloud: OneDrive Pro, OwnCloud
- Remote Access: VPN, SFTP/SCP

■ Sensitive data

Brain and Mind Research and Molecular Medicine deal with Patient Data

- Legal conditions for Sensitive Data Manipulation
- Administrative and Technical Measures
- Separation of Sensitive and „Normal“ data

■ Data Processing

Complex problems

- Polynomial, exponential complexity
- Large sets of data

- Require large computational resources
- Clusters, supercomputers
- 1000's of Processor Cores

- Remote Access: VPN, Terminal Server, TeamViewer, web interfaces

■ Network Services

Laboratory Devices

- often require network connection
- either directly or via computer
- Must be protected from unauthorized use
- Controlling computer can't have AV and enabled updates
- Use of private IP addresses and NAT
- Use of Firewalls

■ Network Services

But

- The operator must be able to access the device from workplace or from home
- It must be possible to let the manufacturer's technician to connect to the device on demand from anywhere



■ Network Services

Network Speed

- Huge amounts of data

Networks Stability

- Required long-term Reliability



■ Servers and Workstations

Servers and Workstations

- must be connected to Internet with appropriate security level
- **Must be Accessible from anywhere**

■ Network services

Only known devices can be connected to the Network

– but

It must be possible to let guests connect easily



■ Network Services

If a Device is moved to another location, it must be possible to connect it without changing network settings

■ Workstation Imaging

Some of the Workstations are very expensive to install

- **A technician must fly from the US**
- **Sometimes 2000 – 4000 Euro**
- **It is possible to make “image” of the hard drive and in case of its failure to restore the system to a new drive**

■ Monitoring

Any failure must be detected ASAP

- **Standard IT components – network, servers and data storage, power supply, temperatures in server rooms**
- **Laboratory equipment: freezers (temperature, power supply), fytotrons (various parameters)**
- **Running experiments**

■ Monitoring

Systems:

- Nagios
- Hardware monitoring devices –
connected over computer network or cell
network

■ Cooperation

Scientists do the Science

- Do not know data analysis, programming, optimization

Thank You

A decorative graphic consisting of several wavy lines. A prominent thick red line curves across the bottom. Above it are several thinner grey lines, some solid and some dashed. Three light blue dots are connected by thin lines, forming a small network-like structure.

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