

Introduction to the Linux OS

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Overview and Organization

Introduction to the Operation system Linux, focus on the command line, scripting, basic services and tools used in (not only) physics: tasks automation in data processing and modeling

Organization

- Graded Assessment (KZ): attendance to the lectures, worked out homeworks

Literature

- C. Herborh: Unix a Linux - Názorný průvodce, Computer Press, Praha, 2006
- D. J. Barrett: Linux - Kapesní přehled, Computer Press, Praha, 2006
- M. Sobell: Mistrovství v RedHat a Fedora Linux, Computer Press, Praha, 2006
- M. Sobell: Linux - praktický průvodce, Computer Press, Praha, 2002
- E. Siever: Linux v kostce, Computer Press, Praha, 1999
- **Number of online sources...**

Study materials and homeworks

- <http://kfa.mff.cuni.cz/linux>



- ① UNIX systems, history, installation, basic applications
- ② Structure of the Linux OS, file systems, hierarchy of the file system
- ③ Command line, shells, remote access (ssh, ftp)
- ④ Processes and their administration, basic system commands, packages, printing
- ⑤ Users, file and directory permissions
- ⑥ Work with files and directories, file compression, links, partition
- ⑦ Text-file processing commands, redirection, pipeline
- ⑧ Regular expressions
- ⑨ Command line based text editors
- ⑩ User and system variables, output processing
- ⑪ Scripts: basic construction, conditionals, loops, functions, automation
- ⑫ Networking, server-client services: http, (s)ftp, scp, ssh, sshfs, nfs
- ⑬ Programming in Linux (examples of Fortran, C/C++, Python), version control systems, documents in Latex

CRON system:

- `/etc/crontab`: basic file to run tasks per hour/day/week/month
- `/etc/cron.hourly`
- `/etc/cron.daily`
- `/etc/cron.weekly`
- `/etc/cron.monthly`
- `/etc/cron.d`: more complicated rules

```
# /etc/cron.d/renew_prak0x: crontab entries for reweval of the prak0x user home directories
# Execute only during the period of the exercises (01.Oct - 20.Jan)
# TODO ?: Add entry in between day in case of 2 excercises per single day

SHELL=/bin/bash

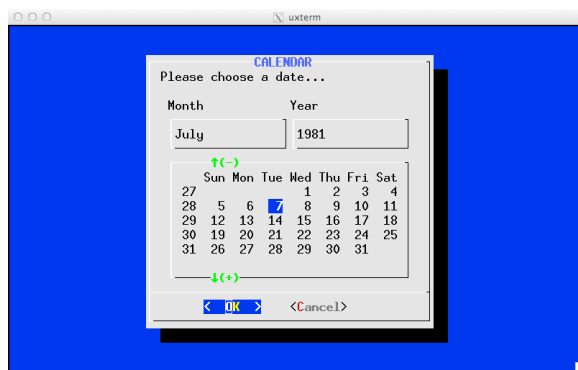
# m h dom mon dow user  command
32 01 * OCT,NOV,DEC,JAN SUN root /home/prak_template/bin/reboot.cron.sh
# NO!!! (studenti by po rebootu nenasli sva data !)
```

#	m	h	dom	mon	dow	user	command
#@reboot						root	/home/prak_template/bin/renew_prak0x.cron.sh
12	03	*	OCT,NOV,DEC		*	root	/home/prak_template/bin/renew_prak0x.cron.sh
12	03	1-20	JAN		*	root	/home/prak_template/bin/renew_prak0x.cron.sh

Graphical interface to scripts

Programs to easily create simple graphics interfaces:

- Calendar
- File selection
- Forms
- Messages
- Lists
- Progress bars
- Text entry



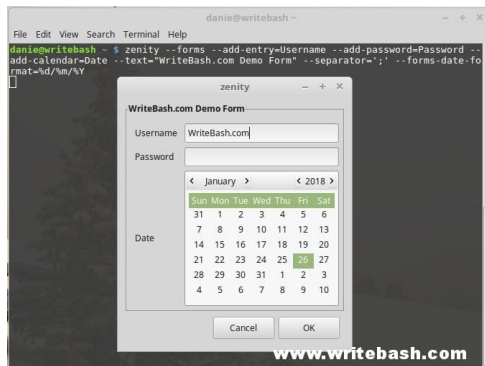
dialog

- Terminal-based graphics
- See number of examples in </usr/share/doc/dialog/examples>

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zenity / gdialog

- Graphical windows (GTK)
- See examples at <https://help.gnome.org/users/zenity/3.32/>

Conversions

Mostly, conversions between various file-formats can be done with graphical applications. The next slides list commands for command-line conversions, for use in scripts (multiple files conversions etc.)

- Figures
- Video files
- PDF files manipulations
- Office documents, txt files
- Number of **xxx2yyy** commands/packages on linux for various file formats...

- Graphical applications: **Gimp** for bitmaps, **Inkscape** for vector graphics
- Batch: **convert** command from **Imagemagick** package
 - See <https://www.imagemagick.org/Usage/>
 - image format
 - resize, rotate, ...
 - image quality
 - animations
 - text → image
- **identify -verbose file** to dump image information

- Number of graphical applications: **Openshot**, **Avidemux**, ...
- Batch: **ffmpeg**, **mencoder**
 - audio/video formats
 - resolution, bitrate
- **ffmpeg -i file** to dump video file information

- Beside commercial Adobe SW only basic operations are possible
- Annotations (graphical applications): **okular**, **Xournal++**
- Editing graphical applications: **Inkscape**, **PDFedit**
- Batch: **pdftk**, **ghostscript**
 - PDF ↔ PS conversions (postscript files - partly editable in text editors)
 - splitting / joining pdf files
 - handling of embedded fonts
- **pdftimage** to extract images from PDF files
- **pdfcrop** to crop white space around PDF file

- WIN ↔ UNIX text files conversion (end-of-line characters): `dos2unix`, `unix2dos`
- Text to postscript file: `a2ps input.txt -o output.ps`
- Text files encoding: `iconv -f "UTF-8" -t "CP1250" input.txt -o output.txt`
- Libreoffice formats: `unoconv -f odt input.doc`

Client-Server Services

- **ssh** for remote login to a command line
- **kerberos** for more secure and complex remote logins
- **telnet** old, now insecure, remote login to a command line
- **scp** to copy files via ssh
- **ftp** to copy files between PCs
 - **sftp** as it secure replacement (uses **ssh**, but emulates **ftp** commands)
- Web-server
- Command line tools to access web-pages
 - **wget**, **curl**: downloading www-page source
 - **lynx**, **elinks**: text-based www browsers, i.e. translating www-page source to the www-page
 - Limited usage on web-pages with e.g. java scripts etc.