# C2110 *UNIX and Programming*

## 13th lesson

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# Compression

- lossless
- lossy

# Compresion

**Compression** is a process which reduces size of the data (files).
This is achieved by searching redundant or irrelevant information in the data, which are then stored more efficiently. Compression algorithms can be divided into two basic categories:

- **lossy compression** – leads to irreversible loss of some irrelevant information, which is usually tolerated, i.e., compressing video or audio data

- **lossless compression** – no loss of original information, compressed data can be fully restored to their original state, the compression ratio is much lower than with lossy compression

Restoring compressed data is called **decompression**.

**Compress ratio** is the measure of the compression quality. It is expressed as the ratio between the size of the original and compressed data.

# Lossy compression

Programs for lossy compression and decompression:

- **mplayer**
- **mencoder**
- **convert** (Image Magick)
- and other...

Converting the image in PNG (Portable Network Graphics) format to JPEG (Joint Photographic Experts Group):

```
$ convert input.png -quality number output.jpeg
```

uses lossless compression

quality ratio of the final image from 1 (worst quality with most compression) to 100 (best quality with worst compression)

uses lossy compresion

# Exercise

1. From the directory **/home/kulhanek/Data/Komprese**, copy the image **test.png** into your home directory.
2. What is size of the image file in bytes?
3. Perform **the lossy compression** of the image to **jpeg** image. Use compression quality **10**, **50** and **90**. Store the resulting pictures separately.
4. Compare **the visual quality** of the compressed images (**display** command)
5. What is the **compression ratio** for the quality 10 and 90?

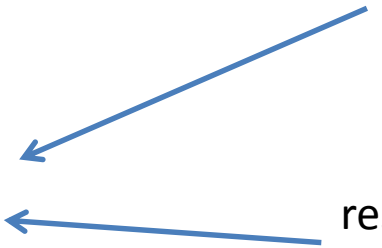
# Lossless compression

Programs for **lossless** compression and decompression:

- **gzip/gunzip**
- **bzip2/bunzip2**
- **zip/unzip**
- and other ...

**Compression** of a text file: :

```
$ gzip  file.txt
$ bzip2 file.txt
```



resulting file will be named **file.txt.gz**

resulting file will be named **file.txt.bz2**

**Decompression** of compressed data :

```
$ gunzip  file.txt.gz
$ bunzip2 file.txt.bz2
```

Result of compression or decompression can be sent to the **standard output** (original file then remains unchanged), e.g.:

```
$ bunzip2 --stdout file.txt.bz2 | wc
```

# Exercise

1. From **/home/kulhanek/Data/Komprese**, copy the text file **bu6_f.log** to your home directory.
2. What is the the size of the file in bytes?
3. Perform **lossless compression** of the file using programs **gzip** and **bzip2**. Which of these two program has **higher compress ratio**?
4. Which of these two program compresses **faster**?

# Archives

- types
- creating and extracting archives

# Archives - tar

**tar (abbreviation from tape archiver)** is a collective name for both the file format used to store many different files and for single-purpose programs that work with this format. The format itself was created at the beginning of Unix and later was standardized within the POSIX standards. Originally it assisted with archiving files onto tape drives, but later its usage expanded and today it is used, when appropriate for the purpose of distribution or archiving, to join **multiple files in one file, in a way that preserves information about the directory structure, access rights and other attributes**, which the file system normally contains.

www.wikipedia.org

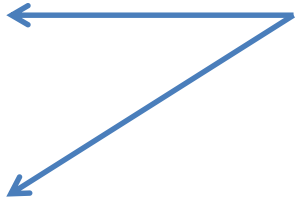
**Archive extraction**:

```
$ tar xvf archive.tar
```

**Archive creation**:

```
$ tar cvf archive.tar directory/

$ cd adresar
$ tar cvf /path/to/archive.tar *
```



if the name of the archive contains suffix .gz or .bz2, archive is automatically compressed or decompressed.

# Exercise

1. What is meaning of the options **cvf** for command tar?
2. What is meaning of the options **xvf** for command tar?
3. Create archive from files stored in the directory: **/home/kulhanek/Data/Archive**
4. What is the size of archive file?
5. Perform compression of the archive. What is the **compression ratio**?
6. Extract archive into the directory **/scratch/your_login/archive**

# Application Compilation

- Application Armagetronad
- Extracting the archive
- Configuration
- Compilation
- Installation

# Armagetronad

**http://armagetronad.org/**

**Procedure:**

1) Downloading of the source code
2) Extract the archive
3) Instruction for the installation (README, INSTALL, doc/README, doc/INSTALL)
4) Configuration
5) Compilation
6) Installation

## Saint triple

```
$ ./configure
$ make
$ make install
```

# Armagetronad, Step I

**All is performed in scratch.**

1) Archive extraction:

```
$ tar xvf armagetronad-0.2.8.3.2.src.tar.gz
```

2) Making of installation directory, i.e., where the program will be installed (necessary if you are not root)

```
$ mkdir armagetronad
$ pwd
/scratch/kulhanek/game/armagetronad
```

3) Change of working directory to extracted archive:

```
$ cd armagetronad-0.2.8.3.2
```

4) Configuration for compilation and installation:

where the program will be installed

```
$ ./configure --prefix=/scratch/kulhanek/game/armagetronad \
              --disable-etc --disable-uninstall
```

In this phase, some libraries or application might be missing. They can be installed in the same way, but it is more appropriate (and faster) to ask admin to install them. To compile, development packages of individual libraries must be installed.
e.g.: `# apt-get install libxml2-dev`

# Armagetronad, Step II

5) Compilation

```
$ make
```

6) Installation

```
$ make install
```

where the program is installed

7) Starting of the program

```
$ cd /scratch/kulhanek/game/armagetronad
$ ./bin/armagetronad
```