DAT151

Bjarte Kileng

HVL

January 8, 2018

Schedule

- Four lectures and two lab sessions every week for seven weeks[1]
- Last lecture on Friday February 23.
- Exam in week ten (between March 5 and March 9).
- Lectures:
  - Monday 10:15 to 12:00
  - Tuesday 10:15 to 12:00[2]
  - Wednesday 10:15 to 14:00
- Lab:
  - Tuesday 12:15 to 14:00
  - Friday 10:15 to 12:00

[1] Except weeks three, five and six.

[2] Tomorrow teaching start at 11.15.

About the course

- Two main subjects, *Database administration* and *Unix systems administration*.
- The course will include both lectures and teaching in lab.
- DAT151 is available at It's Learning.
- Ten study points (studiepoeng).
- We will use E425 for lab. exercises.
- Eight assignments in the form of written reports must be approved.
- Deadlines must be respected. If a deadline causes problem, discuss with the teacher *before* the deadline.

Teachers

- Bjarte Kileng: Bjarte.Kileng@hib.no, E418
  - Database administration and Unix systems administration.
- Maksim Melnik Storetvedt: Maxim.Storetvedt@hvl.no, E506.
  - Unix systems administration.
- Faustin Ahishakiye: Faustin.Ahishakiye@hvl.no, E506.
  - Unix systems administration.
- Violet Ka I Pun: violet@foldr.org.
  - Unix systems administration.

Lectures

- Not all subjects will be covered in the lectures.
- Some sections of the books are well suited for self study.

Preliminary curriculum

- The two books.
- All lecture slides.
- All exercises.
- All material handed out or published on It's Learning.

Exam in DAT151

- Oral exam.
- Exam in week ten (between March 5 and March 9).
- Eight assignments must be approved in order to be accepted for the exam.

Subjects

- Installation and configuration of a database server.
  - The fundamental principles are independent of the choice of server.
  - We will use MariaDB which is based on the source of MySQL.
  - MariaDB has replaced MySQL in CentOS 7.
  - Both MySQL ad MariaDB are free, has support for replication and can be used for database clusters.
- Performance tuning:
  - Tuning of the database server (cache, file system, memory etc.)
  - SQL optimization.
  - Optimizing the data model.
- Security, backup and recovery, replication, database clusters, design of the physical database, transactions, concurrency, etc.

Linux and Unix

- Unix is trademarked as UNIX. UNIX is a copyrighted name held by the Open Group.
- Linux is a Unix Clone, written from scratch.
- POSIX is the UNIX API, and Linux comply to the POSIX standard, i.e. Linux can be considered as UNIX.
  - Linux as *Unix-like* is considered by the Open Group a misuse of their UNIX trademark.
- We will use the Linux distro CentOS 7 for lab exercises.

CentOS, RedHat and Fedora

- RedHat 7 is a commercial distro, much used in enterprise servers.
  - RedHat is also known as RHEL, Red Hat Enterprise Linux.
- CentOS is a popular community Linux distribution built from much of the Red Hat Enterprise Linux codebase and other sources.
  - CentOS 7 is based on RedHat 7.
- Fedora is the development platform for RedHat.
- RedHat 7 is based primarily on Fedora 19, with several changes from Fedora 20 and later.

Unix and GNU/Linux history

- UNIX was developed by AT&T Bell Laboratories.
- First version of Unix came in 1969, written in PD7 assembly.
- First version of Unix written in C in 1973.
  - C was created for the Unix project.
  - C was based B, that in turn was based on BCPL.
- The GNU project was created in 1983.
- Aim of GNU was to create an open source version of Unix, see Philosophy of the GNU Project.
- First version of Linux in 1992.
- Modern Linux distros includes a Linux kernel, system programs and libraries from the GNU project and applications with a GNU license.
  - The correct name of Linux is GNU/Linux.
- Other open-source Unix are e.g.: illumos, FreeBSD, NetBSD, OpenBSD, DragonFlyBSD, Darwin, TrueOS.

Unix and Linux

- Three major flavors of UNIX:
  - BSD UNIX (Berkeley Software Distribution)
  - UNIX System V
  - OSF/1
- Linux includes ingredients both from BSD, System V and also Plan 9.
- The systems are similar, but has differences concerning the boot process, system calls, command switches, and available software.
  - FreeBSD and Mac OSX are both BSD type, but appear very different due to different window systems and software.

UNIX and Unix-like flavours

- Linux
- AIX from IBM (System V)
- HP-UX from Hewlett-Packard (System V)
- Solaris from Oracle (Sun) (System V)
- UnixWare from Xinuos (System V)
- illumos, open-source (System V)
- Darwin from Apple, open.source (BSD)
- FreeBSD, open-source (BSD)
- NetBSD, open-source (BSD)
- OpenBSD, open-source (BSD)
- TrueOS, open.source (BSD)
- Mac OS X from Apple, built on Darwin (BSD)
- iOS from Apple, built on Darwin (BSD)
- UNICOS from Cray (System V and BSD)
- Irix from IBM (System V), discontinued.
- ULTRIX from Digital (System V and BSD), discontinued.
- CNK (Compute Node Kernel), CNL (Compute Node Linux) are minimalistic kernels for super computers (Linux).

Unix and Linux variasions

- Many command shells, e.g. sh, bash, ksh, tcsh, csh, zsh.
- Many window managers.
- Many desktop environments, e.g. GNOME, KDE, Unity.

Linux distros

- Many projects exist that distribute Linux.
  - Due to the GPL licence, everybody can distribute Linux.
- Popular distros include Red Hat, Ubuntu, Debian, Fedora, SUSE, Gentoo.
- Some differences between Linux distros:
  - Choice of software packaging system (e.g. rpm, dpkg).
  - Programs for system administration.
  - System configuration files.
  - Upgrade release schedule.

Why focus on Linux?

- Linux has mostly replaced Unix on enterprise servers.
- Linux is very much used, although hidden for normal users.

Users of Linux

- 90% of the public cloud workload (ref).
  - Probably why Microsoft was a top contributor to the 3.0 kernel (ref).
- 82% of world's smartphones (Android).
- 62% of the embedded market (GoPro, HDTVs, Tesla cars, Linux on embedded systems).
- Major Internet players, Google, Facebook, Twitter, Amazon, Wikipedia.
- All top 500 supercomputers in the world (TOP500 Supercomputers).
- Film industry (ref, ref, ref, ref, ref, ref).
- Inflight entertainment systems (ref, ref), running the Mars rovers (ref), and much more.