An Introduction to Linux

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http://www.onerussian.com/Linux/pres

Part One

Why install Linux, and how to go about doing so.

What is Linux?

- For the purposes of this talk, a Unix like operating system

- It's not directly descended from Unix, but it's designed to work along the same lines

- At the introductory level of this talk, much of what we say about Linux applies to other Unix like systems, for example Free/Net/OpenBSD/MAC OS X?

Why Linux? (opinions of 2001)

- Stable
- Powerful
  - Wide range of capabilities
  - Flexible user interface
- Free (Open Source)
- Wide range of tools
  - Development, publishing, networking, desktop
- A great learning resource
- Can be as geeky/good/friendly as you are

- Why not?
  - It's not Windows; need to learn something new
  - Doesn't run MS Office
  - Doesn't run many of the latest games
  - The Unix command line isn't for everybody

Why Linux? (Now)

- Stable
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- Office
  - OpenOffice.org
  - CodeWeaverers.com
- Games
  - WineX (cedega)
- Why not?
  - It's not Windows; need to learn something new
  - The Unix command line isn't for everybody

What is Linux *really*?

- Linux itself is just kernel
  - The heart of the system; takes care of memory management, interrupt handling…
  - First released by Linus Torvalds on 17th September 1991
  - Still maintained by Linus, with input & patches from interested developers all over the world.
  - Latest release 2.6.9

- The kernel is only useful when used in conjunction with other software
  - GNU Project from Free Software Foundation (Richard Stallman) started in 1985
  - XFree86
  - KDE and GNOME
  - Others

- All this comes nicely packaged up for you in a distribution

What does a distribution do?

- Takes the kernel & other software and sells/gives them to you
- Provide a "friendly" method of installing the system
- Provide security updates and bug fixes

- Provide a method for installing and removing extra software
  - A 'packaging' system
- Provide their own utility software, e.g.
  - Printer setup,
  - Network setup,
  - And so on

Which distribution to use?

- A matter of personal preference (there are > 300 of officially registered distros)
- Debian
  - Supports > 11 architectures
  - Open development model, excellent packaging system
  - I use Debian

- RedHat/Fedora
  - Big, professional, very widely used
  - "Microsoft of Linux"
- Mandrake, SuSE, Slackware
  - Aims to be very easy to install and use
- Gentoo
  - For real geeks with a lot of CPU time in hands

Installation

- Can give it a spin by trying live-CD distro
- Varies from distribution to distribution
- Most modern distibutions make it easy:
  - Buy CD / download and burn CD image
  - Boot
  - Follow instructions
  - Alternative (live-CD way)
    - Boot, work, copy/install (Knoppix, Morphix, MEPIS)
- Offers dual-boot
- Boots via network
- Fully Automatic Install (for clusters)

Useful resources for part one

- http://www.kernel.org/
- http://www.gnu.org/
- http://www.distrowatch.com/
- http://www.debian.org/
- http://www.redhat.com/
- http://www.morphix.org/
- http://www.knoppix.org/
- http://www.mepis.org/
- http://www.suse.com/
- http://www.linux-mandrake.com/en/
- http://www.slackware.com/
- http://www.desktoplinux.com/articles/AT3135712364.html

Part Two

Ok, so it's installed – what next?!

khun_yindee

Conversation   Options

😊 khun_yindee

(00:27:57) **khun_yindee**: That you mike
(00:28:03) **norhloudspeaker**: How are you?
(00:28:08) **norhloudspeaker**: How many months are you now?
(00:28:27) **norhloudspeaker**: I saw someone else online and thought it was them.
(00:28:34) **norhloudspeaker**: That is me.
(00:28:38) **khun_yindee**: Mike you still there?
(00:28:41) **norhloudspeaker**: I am here

⚠ Warn   ❌ Block   📁 Send File   ➕ Add   ℹ Info   💬 Send

Inbox - Ximian Evolution

File Edit View Actions Tools Search Help

New | Send / Receive | Reply   Reply to All   Forward

0 new, 1 selected, 1 total

Find Now   Clear

Subject   Date
...ev... Welcome to Ximi... Jun 25 2002

Welcome to Ximian Evolution! - Message

File Edit View Actions

Reply   Reply to All   Forward |

From: Ximian, Inc. <evolve@ximian.com>
To: Ximian Evolution Users <evolve@ximian.com>
Subject: Welcome to Ximian Evolution!
Date: 25 June 2002 14:45:00 +0300

Ximian is proud to welcome you to **Ximian Evolution**, a complete system for managing your communications and personal information.

Getting Started

On the left of the Ximian Evolution window is the Shortcut Bar, with icons for each of your primary tools: Summary, Inbox, Calendar, Tasks, and Contacts. You can click on those icons to jump from one tool to another. For more detailed information management, activate the Folder Bar by selecting Folder Bar from the View menu.

<evolve@ximian.com>
ution Users <evolve@ximian.com>
Ximian Evolution!
2 14:45:00 +0300

oud to welcome you to **Ximian**

Shell   Skyp   Moz   Evo
aRts   mep   Gair

12:41
2004-10-20

```
.................................:Mon Nov  8 20:51:35 EST 2004:.
sonyboy[0] ~>echo "Welcome to Konsole"
Welcome to Konsole
.................................:Mon Nov  8 20:51:35 EST 2004:.
sonyboy[0] ~>
```

Shell   Shell No. 2

Users

- Linux is an intrinsically multi-user system

- Every user on the system has their own username & password

- The `root` user has ultimate power to run the system. You should **not** log in as `root` unless you really need to
  - Even if you think you need to be root, consider tools such as `sudo` instead

- During installation, you should have been prompted for a root password and also a username & password for an ordinary user account.

Virtual consoles

- Demonstrate multi-user capabilities.

- After logging in, hit `(Ctrl+)Alt+F2`. You can now log in again – as a different user if you like – on this new console.

- After logging in, type `w` to see that you really are logged in twice.

- You could also log in from a remote system (using SSH or similar) while still being logged in at the console.
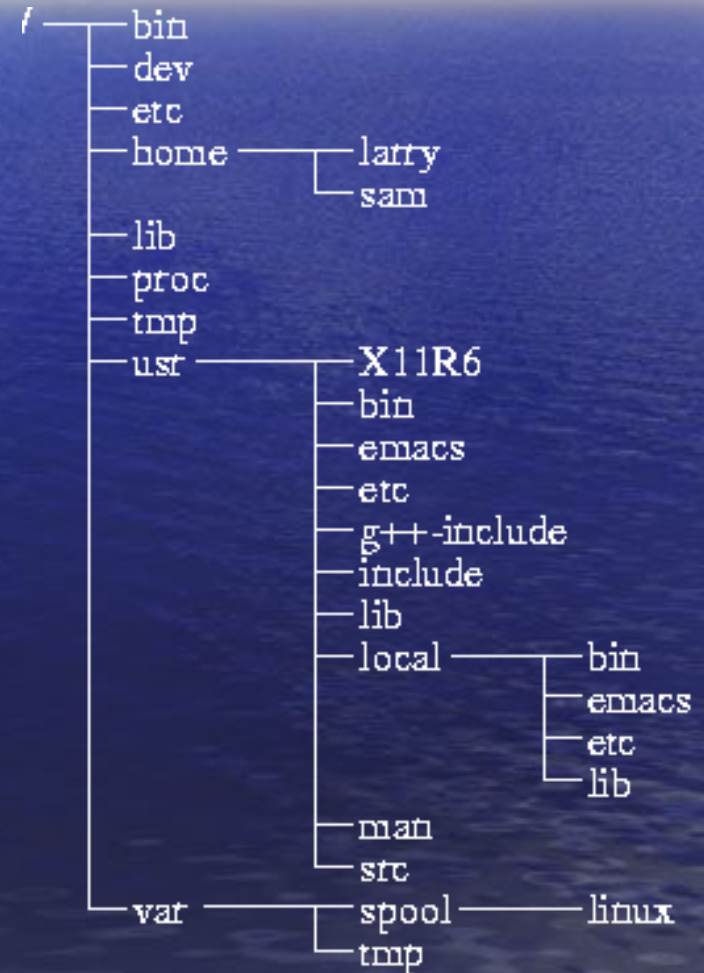
Shells

- The shell reads your input at the command line and translates it to the operating system

- Can run external programs (e.g. `mozilla`)

- String multiple commands together in a shell script

- Makes user's work efficient: commands/filenames completion/expansion

- Various different shells available: bash, tcsh, zsh etc

Files and directories

- Linux shares the concept of files and directories with most other everyday systems.

- In general, a filename can contain any character except "/", and is limited to 256 characters long.

- Directories work in much the same way as in DOS based systems, except that instead of "\" we use "/".

- Note the case sensitivity – `Mozilla` and `mozilla` are **not** the same!

The directory tree

- Unlike DOS, not directly related to the physical disk/partition layout
- Some directories are actual filesystems; others, like `/proc`, are generated by the kernel
- Device files, usually in the `/dev` directory are not standard files, but actually an interface to devices. For example, reading `/dev/mouse` might show data coming from the mouse
- A disk partition can be mounted on any directory in the tree

```
/ ┬── bin
  ├── dev
  ├── etc
  ├── home ┬── larry
  │        └── sam
  ├── lib
  ├── proc
  ├── tmp
  ├── usr ┬── X11R6
  │       ├── bin
  │       ├── emacs
  │       ├── etc
  │       ├── g++-include
  │       ├── include
  │       ├── lib
  │       ├── local ┬── bin
  │       │         ├── emacs
  │       │         ├── etc
  │       │         └── lib
  │       ├── man
  │       └── src
  └── var ┬── spool ─── linux
          └── tmp
```

Noteworthy directories

- `/bin`
  - Programs needed to run the system
- `/dev`
  - Device files
- `/etc`
  - Configuration files
- `/home`
  - Users home directories
- `/lib`
  - Shared libraries needed to run the system
- `/mnt`
  - Traditional place for mountpoints like /mnt/cdrom

- `/proc`
  - Provides information about running process and the state of the kernel
- `/sbin`
  - Like `/bin`, but commands only needed by root user
- `/usr`
  - Programs, libraries, etc not essential for system running.
- `/var`
  - Log files, mail spool and so on.

Navigating

- `cd`
  - Change directory
  - Equivalents:
    - `cd /home/jds`
    - `cd ~jds`
    - `cd` (assuming you're logged in as jds)
- `ls`
  - List directory contents
- `mkdir`
  - Make a new directory

- `cp`
  - Copy files/directories
- `rm`
  - Delete files or directories
- `mv`
  - Move files or directories
- `less` (or `more`)
  - View the contents of files

Help! Too many commands!

- `man` is your friend.
  - `man cp`
    - Help on `cp`
  - `man -k cp`
    - List of everything which has "cp" in its description (ok, there's lots of them, bad example ;-))
  - `man man`
    - How does man actually work?
- `info` is the preferred GNU system for documentation.
  - A pain in the neck to use
  - Try the `pinfo` viewer

Standard I/O streams

- Many programs take input from standard input and produce output on standard ourput.

- Error messages are sent to standard error.

- Often, stdin is the keyboard and stdout & stderr are the screen
  - But they can be redirected.

- Example: `cat.`
  - Reads data from stdin. Sends it to stdout.

Plumbing

- We can redirect standard output to a file
  - `cat > filename`
- Or bring standard output in from a file
  - `cat < filename`
- Or both
  - `cat < file1 > file2`
- We can also send the standard output of one command to the standard output of others
  - `cat < file1 | cat > file2`
- The "Unix philosophy": don't have one monolithic, do everything application. Have small programs that do one thing well & can work together.

Groups & permissions

- Each user can be a member of one or more groups
  - `groups` command

- Each file/directory is owned by a user and a group
  - `ls -l`

- The file owner can set permission on who can read/write/execute a file.

- Permissions can be set for each of owner, group and others.
  - `chmod` command
  -

- Permissions are listed in the form `rwxrwxrwx` in the output of `ls -l`
  - Three groups of three
  - Read, write, execute for each of
  - User, group, others
  - The first character represents the type of file

Links

- Give a single file more than one name

- Create links using `ln`

- Hard links
  - Multiple file names pointing to the same inode
  - `ls -I`
  - `ls -l` displays number of links to file

- Symbolic links (symlinks)
  - Not linked by having the same inode
  - `ls -l` displays link target – note the filetype!

Processes

- Linux is a multitasking system – there can be many processes running at the same time
  - `ps`
- Each process has a unique process ID ('pid') number
- Processes can run in the foreground or in the background
  - There can only be one foreground process at any given time. It is this processes with which the user interacts.
- Suspended processes are temporarily stopped, and can be sent either to the foreground or background as required.
- The shell can control processes

Job Control

- Kill the foreground process: `Ctrl+C`
- Suspend the foreground process: `Ctrl+Z`
- Send the suspended process to the:
  - Foreground: `fg`
  - Background: `bg`
- Start a process in the background: append an `&` to the command
  - E.g. `yes &`
  - Note the PID and job number
- Check the status of processes
  - `jobs`

Killing processes

- Use the `kill` command
  - Either with the PID, for example:
    - `kill 22916`
  - Or with the job number:
    - `Kill %2`
      - Note the '%'!
- Or use `killall` with the command name:
  - `yes > /dev/null & killall yes`

Useful resources for part 2

- http://www.linuxdoc.org/
- Your own distribution's documentation
- HOWTOs (`locate HOWTO`)
- `man hier`
- `man bash`
- Other man pages (ps, ls, ln, kill, killall…)

Part Three

The X Window System, or how to make a 50-MIPS workstation run like a 4.77MHz IBM PC

X: A graphical interface for Unix

- If the designers of X-Windows built cars, there would be no fewer than five steering wheels hidden about the cockpit, none of which followed the same principles – but you'd be able to shift gears with your car stereo. Useful feature, that.
  - Marus J. Ranum, Digital Equipment Corporation

- Despite the above quote, X isn't all bad. It's actually a remarkably powerful, network aware windowing system which has shown a great deal of adaptability

- Most Linux distributions come with XFree86
  - An open source implementation of the X Window Specification

- X is a huge subject; we're not going to attempt to cover it all here. Instead, I'll aim to give a flavour of the things X can do and the graphical environments which make use of it.

Clients and servers

- X is network aware
  - Run a program on one machine, have it display on another
- The terminology around this is, perhaps, counterintuitive…
- An X **server** runs on the machine where the display is to appear
- The X **client** runs on a remote machine and sends data to the server to display
- So, contrary to the usual definitions, you sit at the server and the clients run remotely!
- (Most of the time on your Linux workstation, the clients and the server run on the same machine.)

X and the GUI

- X itself provides the back end needed for a GUI. It doesn't, however, provide an interface itself.

- Window management functions – e.g. moving or resizing windows – are performed by a window manager, which is itself an X client. These range from the spartan (twm) to the complex and graphically intensive (Enlightenment).

- There are various different toolkits for creating graphical applications, providing libraries of widgets such as buttons etc. These range from the old and ugly (Motif) to the new and shiny (GTK+, Qt)

- No two users can be assumed to have the same window manager and different applications can use different toolkits (or even write their own). Therefore, there's a lack of consistency about the average X desktop – this makes things ugly and can be hard to use.
The solution: stick to unified desktop environment like KDE or GNOME

Desktop environments

- Attempt to produce a consistent environment and set of applications

- Two major projects along the same lines
  - GNOME, using the GTK+ toolkit
  - KDE, using the Qt toolkit

- Some people (including me) find that the desktop environments are big, slow and ugly without actually adding much usability
  - Luckily, it's possible to use most KDE/GNOME software without running the whole environment

Useful resources for part 3

- http://www.xfree86.org/
- http://www.xwinman.org/
- http://www.gtk.org/
- http://www.trolltech.com/products/qt/
- http://www.kde.org/
- http://www.gnome.org/
- http://www.windowmaker.org/

Part Four

What you've got in the box
or
what you haven't paid for.

Office

- WYSIWYG Office Environments
  - OpenOffice.org
  - GNOME Office
  - Koffice (KDE suite)
- WYSIWYM Publishing
  - LaTeX, BibTeX, pybliographer
  - LyX

- Desktop Publishing
  - Scribus

- Graphics
  - GIMP
  - DigiKam, gtkam
  - GQView, qiv, xv

- Portable Documents
  - Acroread, Xpdf
  - DJView

Internet

- **Browsers**
  - Mozilla, Firefox
  - Konqueror (KDE)
- **All-In-One Email Clients**
  - Evolution
  - Sylpheed
- **Messengers**
  - GAIM
  - Kopete

- **FTP and Downloaders**
  - D4X
  - GFTP
- **Voice Over IP (VOIP)**
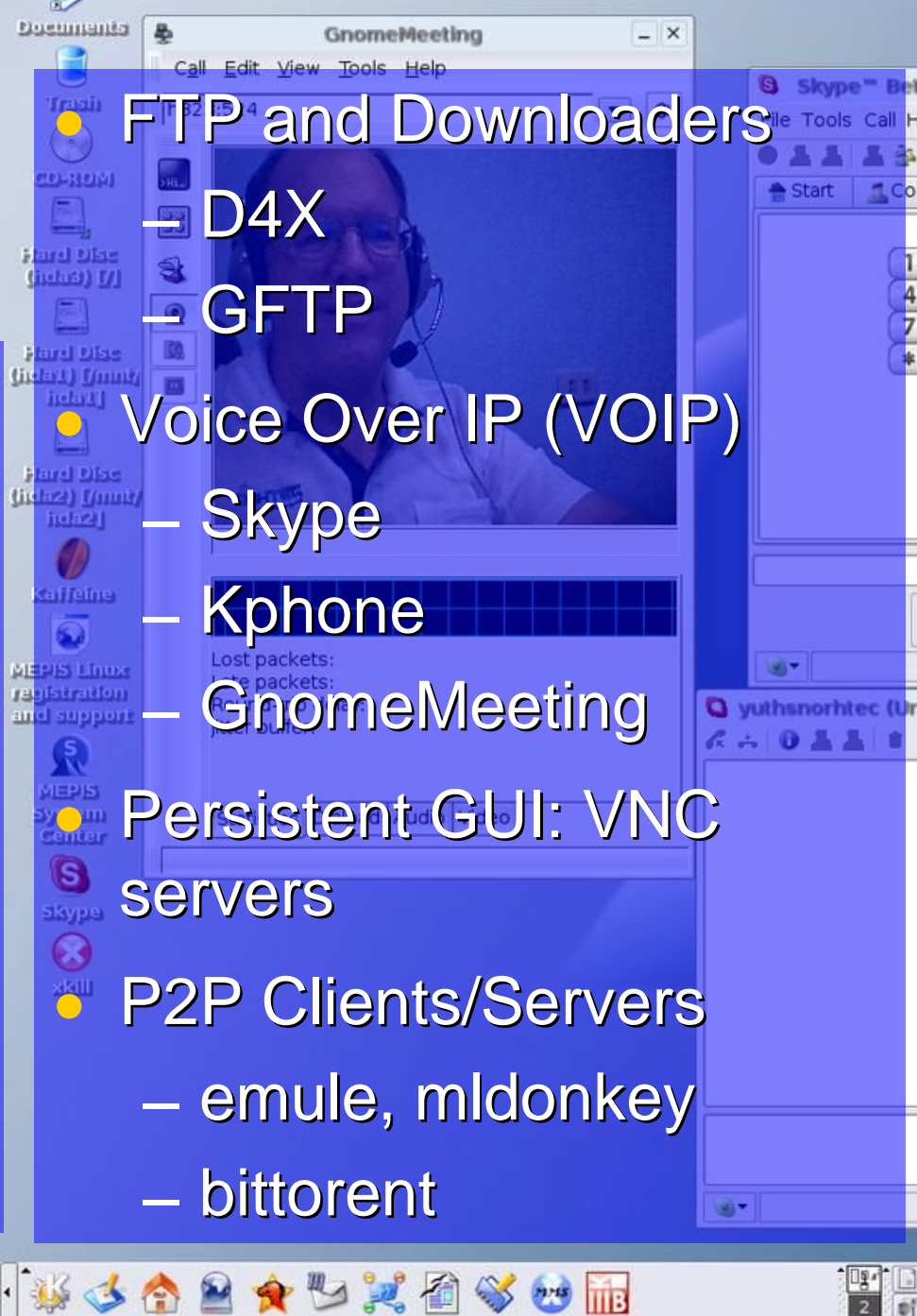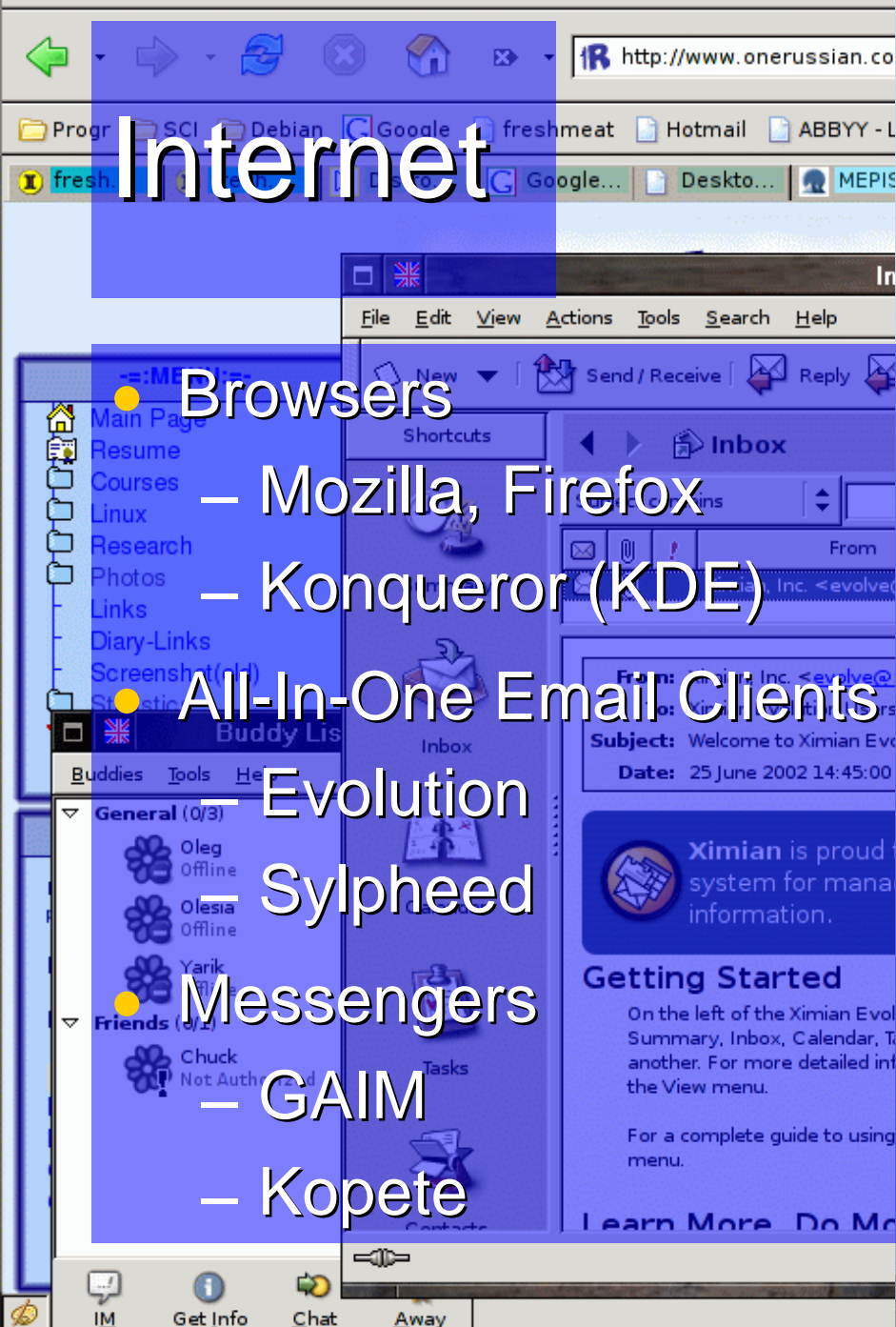 - Skype
  - Kphone
  - GnomeMeeting
- **Persistent GUI: VNC servers**
- **P2P Clients/Servers**
  - emule, mldonkey
  - bittorent

FUN

- Audio
  - xmms (mp3 etc)
  - audacity (edit sound)
  - gtkpod (ipod UI)
- Video
  - Mplayer (anything)
  - XINE
  - vlc (VideoLAN player)
  - dvdrip

- Burning CDs
  - XCDRoast
- Games
  - Doom 3
  - Return To Castle Wolfenstein
  - 100s more via Xwine
  - Basket of free Linux games

Useful resources for part 4

- http://www.openoffice.org/
- http://www.sourceforge.net/
- http://www.freshmeat.net/
- http://www.frankscorner.org/

The End

Comments, questions, pub…