

# Knowledge, Power and free Beer 2.0

Andreas Tille

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# Outline

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# Code in general

- a rule for converting a piece of information into another form or representation
- Examples:
  - DNA contains rules to build protein representations
  - Computer source code are rules to build executable programs
  - ...

# Code invented by nature

## Example genetic code

```
TGAT ACTG CCTT GCAT ATCG CTAA TAGT GTCA TCTA TACC ACTG ATAC CTTG CATA
TCAG TAAT ACTG TCTT GCAT ATCG CTAA TAGT GCCA TTCA TACT ACTG ATAC TGCC
TTGC ATAT CGCT AATA GTGC CATT CATA CTAC TGCC TTGC ATAT CGCT AATA GTGC
CTTG CATG CCAC TAAT AGTG TCTT CGAT ACCA TTAA TATT GCTT TGCA TATC ACTA
ATAG TGCC TTCG ATAC CACT GATA CTAC CTTG CATA TTAC TAAT ATTA CCTT GCAT
```

- *Genetic code* is the set of rules by which information encoded in genetic material is translated into proteins by living cells.
- Research needed to understand
- Interpreted by biological replication mechanisms
- Needs technological invention to change

# Code invented by men

## Executable code of program saying `Hello world`

```
...  
0000350 428d a301 95ac 0804 14ff a885 0494 8b08  
0000360 ac15 0495 3908 72da c6e7 a805 0495 0108  
0000370 c483 5b04 c35d 768d 8d00 27bc 0000 0000  
0000380 8955 83e5 08ec b0a1 0494 8508 74c0 b812  
0000390 0000 0000 c085 0974 04c7 b024 0494 ff08  
00003a0 c9d0 90c3 4c8d 0424 e483 fff0 fc71 8955  
...
```

- *Machine code*: system of instructions and data executed directly by a computer's central processing unit. It is the lowest-level representation of a computer program.
- Intended to be interpreted by computers
- Hard to understand and sometimes forbidden by law
- Comparison to genetic code is weak - but some similarities

# Code invented by men

## Source code of `hello.c`

```
#include <stdio.h>
int main (void) {
    printf("Hello World");
    return 0;
}
```

- *Source code*: collection of statements or declarations written in some human-readable computer programming language. Source code allows the programmer to communicate with the computer using a reserved number of instructions.
- A computer program's source code is the collection of files needed to convert from human-readable form to some kind of machine code
- Problem: you do not always get access to the source code

# Measuring bugs

- Average software project - without inspections - runs about a 5% error rate<sup>1</sup> (= 1 bug per 20 lines of code)
- Space Shuttle project runs one bug per 400,000 lines of code (0,00025%) at a cost of \$1000/line<sup>2</sup>.

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<sup>1</sup>201 Principles of Software Development, Alan Davis

<sup>2</sup>[www.fastcompany.com/online/06/writestuff.html](http://www.fastcompany.com/online/06/writestuff.html)

# Isn't this brave?

*In my books I offer rewards for the first person who finds any particular error . . . In software I similarly pay for errors in the T<sub>E</sub>X and METAFONT programs. The reward was doubling every year: It started out at \$2.56, then it went to \$5.12, and so on, until it reached \$327.68, at which time I stopped doubling. There has been no error reported in T<sub>E</sub>X since 1994 or 1995, although there is a rumor that somebody has recently found one. I'm going to have to look at it again in a year or two. I do everything in batch mode, by the way. I am going to look again at possible errors in T<sub>E</sub>X in, say, the year 2003.*

October 5, 2001, at the Technische Universität München, Donald Knuth presented a lecture entitled “All Questions Answered”.



# Hard Ware

- Vendor and vendee can
  - ① Weigh it
  - ② Bite it
  - ③ Throb it
  - ④ ...
- both are able to check the ware
- Rights of the vendee
  - ① Ownership
  - ② Alteration
  - ③ Sale
- Duplication not worth the effort

# Soft Ware

- Is it really ware?
  - ① Weight?
  - ② Checkable?
  - ③ ...
- Rights of the buyer of the license
  - ① Right to use
  - ② No changes
  - ③ No selling
- Duplication prevented by technical means

# Fresh fish



- Market: vendee and vendor able to evaluate ware
- Does soft ware stink?

# Soft ware is not for sale

- Three instances of “free”
  - ① *Download binary code here* → “free beer”
  - ② See everything, hear everything - but say nothing
  - ③ Free Software
- Where’s the catch?

# Cost of a Linux Distribution

- Calculation was done by D. Wheeler for Red Hat Linux 7.1 (June 2001)
- Today's Debian might contain about ten times more lines of code

## Estimation of costs of RedHat 7.1

- ➊ > \$1 *Billion* to develop this Linux distribution by conventional proprietary means in the U.S. (in year 2000 U.S. dollars).
- ➋ Includes > 30 *million* physical source lines of code (SLOC).
- ➌ Would have required about 8,000 *person – years* of development time, as determined using the widely-used basic COCOMO model.
- ➍ Represents over a 60% increase in size, effort, and traditional development costs over Red Hat Linux 6.2 (which was released about one year earlier).

# The catch: Free $\neq$ free of charge

- Crucial: free usage of the code
- Free in the sense: “free speech”
- Free speech requires
  - Time to prepare  $\rightarrow$  time is money
  - Competence  $\rightarrow$  skilled experts cost money
- You have the freedom to . . .
  - 1 run the program however you wish
  - 2 help yourself (study the source code and change it to do what you wish)
  - 3 help your neighbour (copy the programme and distribute the copies to others when you wish)
  - 4 help your community (publish or distribute a modified version when you wish)

# WikiPedia

- Free knowledge
- Just try: *wikipedia.org*
- Look up own special field
  - ... and he saw that it was good.  
*or*
  - ... he made it better.
- Do you realise how frequent *WikiPedia edits* are?



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Published online 16 December 2008 | Nature | doi:10.1038/news.2008.1312

News

## Publish in Wikipedia or perish

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### This article elsewhere



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**Journal to require authors to post in the free online encyclopaedia.**

[Dedan Butler](#)

[Wikipedia](#), meet [RNA](#). Anyone submitting to a section of the journal *RNA Biology* will, in the future, be required to also submit a Wikipedia page that summarizes the work. The journal will then peer review the page before publishing it in Wikipedia.

The initiative is a collaboration between the journal and the RNA family database (Rfam) consortium led by the [UK Wellcome Trust Sanger Institute](#) in Hinxton. "The novelty is that for the first time it creates a link between Wikipedia and traditional journal publishing, with its peer-review element," says Alex Bateman, who co-heads the Rfam database. The aim, Bateman says, is to boost the quality of the scientific content on Wikipedia while using the entries to update the Sanger database.

### Share the data

*RNA Biology* will require Wikipedia pages from all authors who submit work to a new section of the journal, to be launched later this week,



# At least one Wikipedia article



## RNAbiology

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Abstracted/Indexed in Medline/PubMed and Index Medicus.

Print ISSN: 1547-6286, Online ISSN: 1555-8584

### guidelines for authors

#### Guidelines for the RNA Families Track

This track will primarily publish articles describing either: (1) substantial updates and reviews of existing RNA families or (2) novel RNA families based on computational and/or experimental results for which little evolutionary analysis has been published. These articles must be accompanied by STOCKHOLM formatted alignments, including a consensus secondary structure or structures and a corresponding [Wikipedia](#) article. Publication in the track will require a short manuscript, a high quality Stockholm alignment and at least one Wikipedia article; Each centered around the RNA in question.

#### Writing the manuscript:

The article itself should adhere to the format: Abstract, Introduction, Results, Discussion, Materials and Methods and Supplementary Material.

**The Introduction** should give an overview of the family detailing how and when were the original members identified, what is the function (if known) of the family and what was previously known about the taxonomic distribution of the family.

**The Results** section should discuss the new homologues (distinguishing paralogues and orthologues) found in the study, discuss the taxonomic distribution and evolutionary conservation of the families sequence and structure. Suggested figures are secondary structure diagrams, alignments (of the smaller families), phylogenetic trees and sequence logos.

# Open Access to scholarly information

- Open Access platform aims to meet the growing demand for information to various target groups.
- Unrestricted, toll-free online access to scientific and scholarly knowledge and information
- Very topical and forward-looking issue and a movement which enjoys great support worldwide
- Increased visibility – and accordingly the greater impact – of openly accessible scholarly and scientific texts
- The Fraunhofer-Gesellschaft, the Helmholtz Association and the Max Planck Society have their own web pages where they provide information on their OA activities.

## Excursus I: Distribution of artworks

- Artist deserves enough reward for his work to be motivated to continue and enhance his creative work
- DRM reserves the rights of companies of Recording Industry not the rights of artists
- Better chances for artists not contracted by Recording Industry
- Needed: better laws to reflect new reality

# Simple example



## More prominent example

Science Fiction author Cory Doctorow:

- Traditional media companies try to apply copyright laws of analog world in digital world
- Instead of making an effort to prevent copying Cory Doctorow releases books under Creative Commons License
- Success: Most readers will be attracted to by a printed copy after reading free electronic version
- 11 official translations - but even more unofficial ones (which is permitted by CC license)
- Similar model used by Brazilian author Paulo Coelho

# Role of E-books

- Role of E-books is not clear - but makes digital copies of books much more interesting
- Change will happen in classical publishing and in book stores
- Opportunity for unknown authors to gain popularity independently from publishers

## Excursus II: Open Hardware?

Riversimple Urban Car is an open source  
hydrogen Fuel cell vehicle



# Riversimple Urban Car

- Working demonstrator vehicle on 16th June 2009
  - Production is planned to begin by 2013
  - Developed by teams at Cranfield and Oxford Universities
  - Open Source design will be stored on Wiki site online
  - Any small manufacturer can lease the design for free, modify it as desired, and build their own version of the vehicle
- Nobody can say whether this concept will be really successful – but everybody can notice very new concepts of opening knowledge



# As You Like it

- Sustainable functionality
- Functionality matters, name of the program does not
- Functionality = Program + Service
- Reasonable amount of cost is acceptable
- Program free of charge → more money for service left
- Open sources → contributors
- Quality increases with the number of users ...
- ... who have understand the principle and report bugs

# Get the facts

An open operating system has not only advantages



# Get the facts

*“First they ignore you,  
then they laugh at you,  
then they fight you,  
then you win.”*

*– Mahatma Gandhi*

Since about 2002 phase 3.

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# We will use OS

February 25, 2009 1:47 PM PST

## Muglia: Open source to permeate Microsoft

Open-source entrepreneurs like Sun Microsystems' Zack Urlocker and Cloudera's Mike Olson were on parade on Wednesday at the **Stanford Accel Symposium**, but the biggest open-source announcement of all came from Bob Muglia, president of Microsoft's Server and Tools Business.

Alfresco CTO John Newton was twittering the event and **posted these comments from Bob Muglia's presentation**:

At some point, almost all our product(s) will have open source in (them).

If MySQL (or) Linux do a better job for you, of course you should use those products.

The reality is that more and more of Microsoft's products **already do include open-source software** (including MSN Messenger and Visual Studio), but it's still refreshing to hear **Microsoft acknowledge** what most enterprise software companies--including proprietary software companies with much to lose from open source--already know: open source is mainstream.



Bob Muglia

## My bet

- I predict that in 17 years either Windows™ will be Free Software or not the leading operating system any more.

# Free software will kill Redmond I

Quotes of Keith Curtis, a programmer with Microsoft for 11 years who has written a book about why the Redmond way will fail:

*“After the Software Wars”*

- *proprietary software is holding us back as a society*
- While proprietary software made Microsoft one of the most successful companies of all time, it's a model destined to fail because it doesn't let software programmers cooperate and contribute, and thus stifles innovation.
- *As long as Microsoft and its proprietary model dominate, Curtis says, we will live in “the dark ages of computing.”*
- The free software community is producing technically superior products through an open, collaborative development model. People think of Wikipedia as an encyclopedia, and not primarily software, but it is an excellent case study of this coming revolution.

# Free software will kill Redmond II

- *Even Apple threw away their proprietary kernel and replaced it with a free one.*
- Free software undermines Microsoft's profit margins. Even if Microsoft were to adopt Linux
- *I worked on text engines for five years at Microsoft and wrote my book using OpenOffice.*
- If Microsoft, 20 years ago, built Windows in an open way, Linux wouldn't exist, and millions of programmers would be improving it rather than competing with it.
- *Microsoft is manning a leaky ship, and the only thing they can do is just try to pump water faster.*
- The biggest difference between Windows and Linux is that free software contains thousands of applications, installable with one click, and managed as one set.



# Who releases his software?

There is a tendency that No. 2 or 3 in market release their products as Free Software:



# Who is sure that his data are safe?

Borland Interbase backdoor exposed

**Open source reveals foolishly hardcoded password**

By [Kevin Poulsen](#) • [Get more from this author](#)

Posted in [Music and Media](#), 12th January 2001 05:45 GMT

SecurityFocus.com

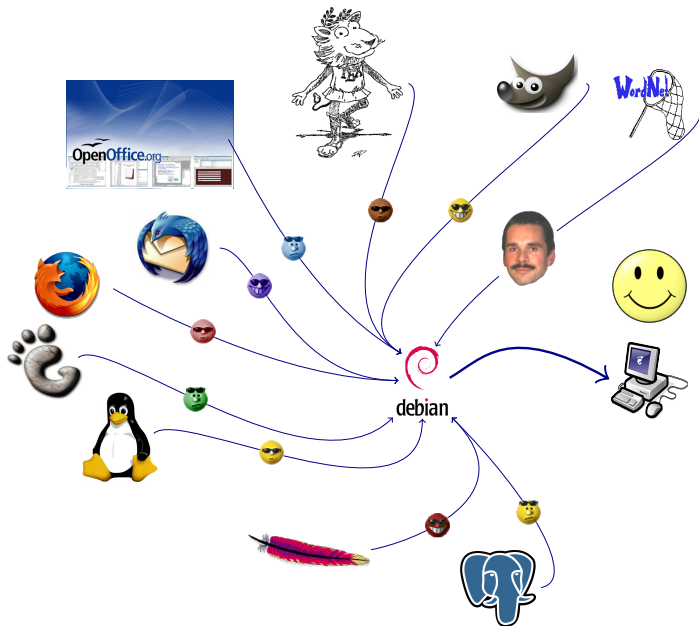
A back door password has been hidden in Borland/Inprise's popular Interbase database software for at least seven years, potentially exposing tens of thousands of private databases at corporations and government agencies to unauthorized access and manipulation over the Internet, experts say.

Analysts report that the account name 'politically' with the password 'correct' unlocks access to Interbase versions 4.0, 5.0 and 6.0 over the Net, and on any platform. Moreover, because Interbase has the ability to execute user-defined functions, the back door can be used to inject malicious code into a system, which could give an attacker administrative access to the computer itself, according to a Wednesday advisory from Carnegie Mellon University's Computer Emergency Response Team ([CERT](#)).

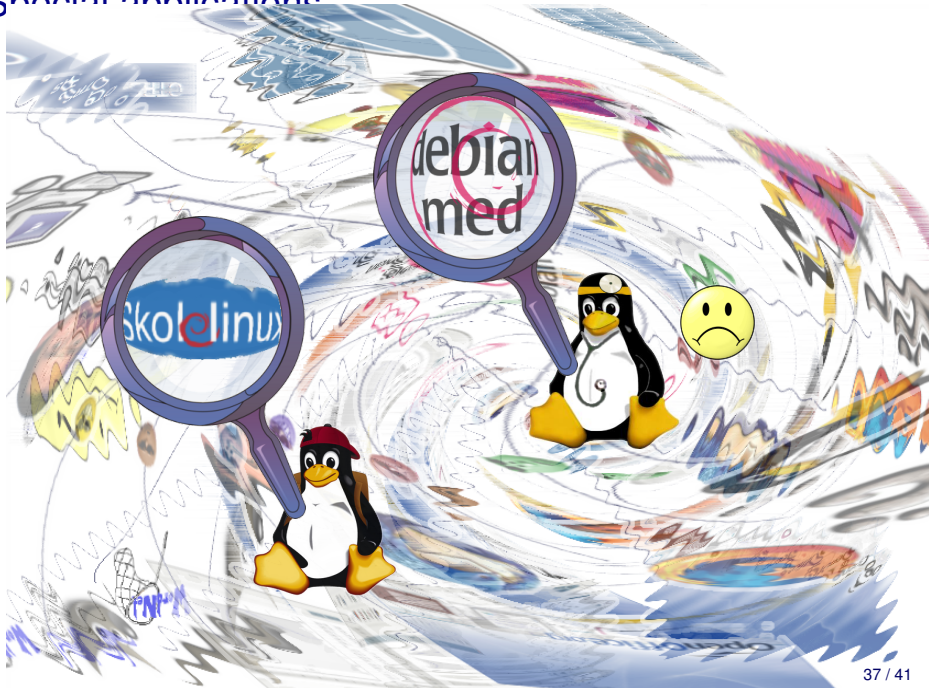
# Distribution



# Debian



## Special applications



# What to do when buying new software

- Is there anybody who likes a dongle or complicated registering procedures?
- Ask sellers of devices to free their code and ask them what they might lose if they do so
- The only thing they might lose is the trust in their company if a skilled programmer might have a look at their rotten code
- Don't ask what your competitor *might* win – ask what your *effective* win really is.
- Just save the effort to hide your knowledge

# Making the world a better place?

- It's not that I'm a specifically nice person because I share my code – I just learned that it is more effective to do so  
*But perhaps people consider myself to be a bit more nicely 😊*
- Free Software is not to make the world a better place – it's just a way to give information to those who might use it.

This talk can be found at  
<http://people.debian.org/~tille/talks/>  
Andreas Tille <tille@debian.org>