Open Source Technologies

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@helghareeb

FOSS?

FOSS?

- Software?

FOSS?

- Software?
- Development methodology?

FOSS?

- Software?
- Development methodology?
- Industry?

FOSS?

- Software?
- Development methodology?
- Industry?
- Community?

FOSS?

- Software?
- Development methodology?
- Industry?
- Community?
- Open Standards?

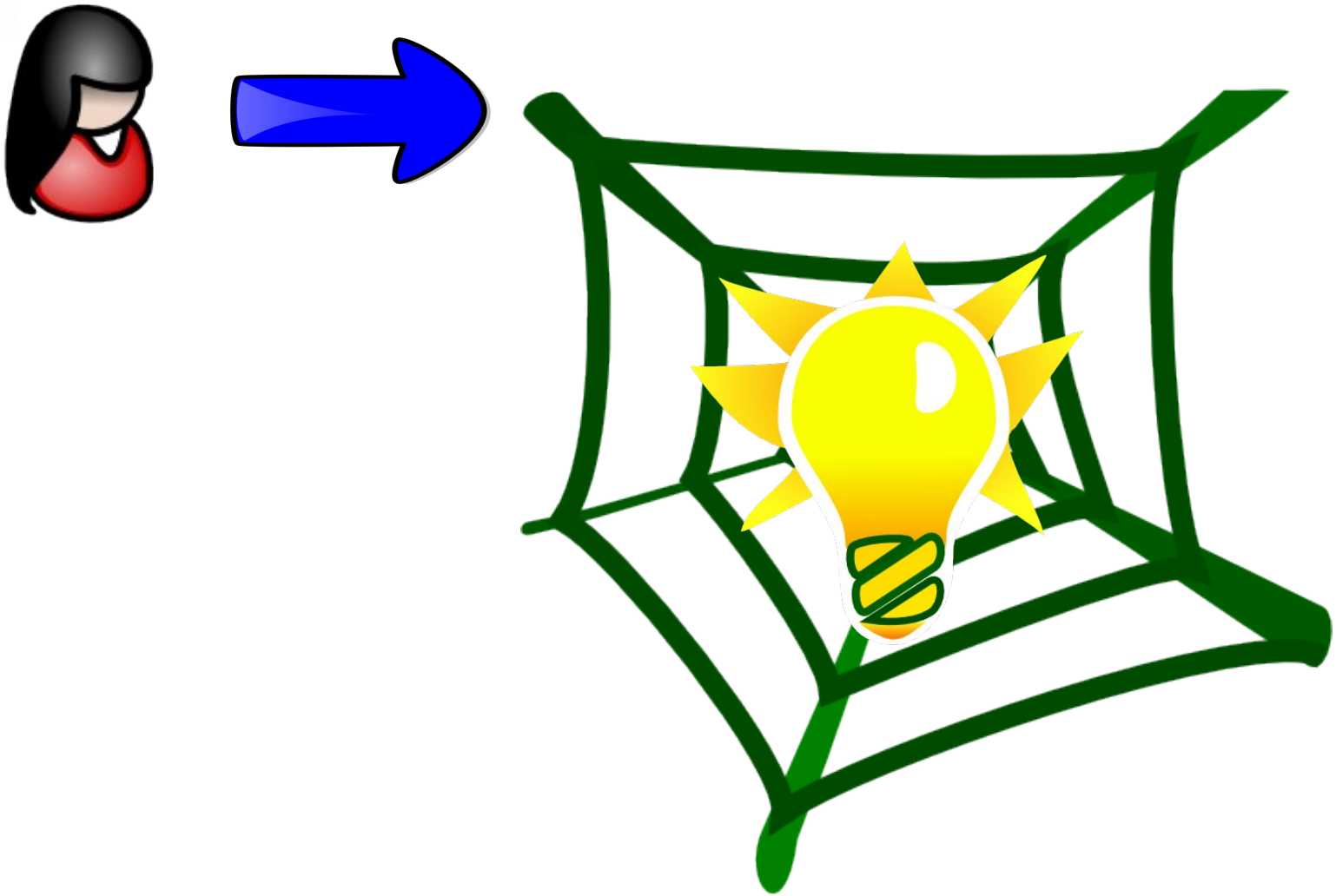
FOSS

- Software
- Development methodology
- Industry
- Community
- Open Standards
- And, and, and....

FOSS is an ecosystem of **people**

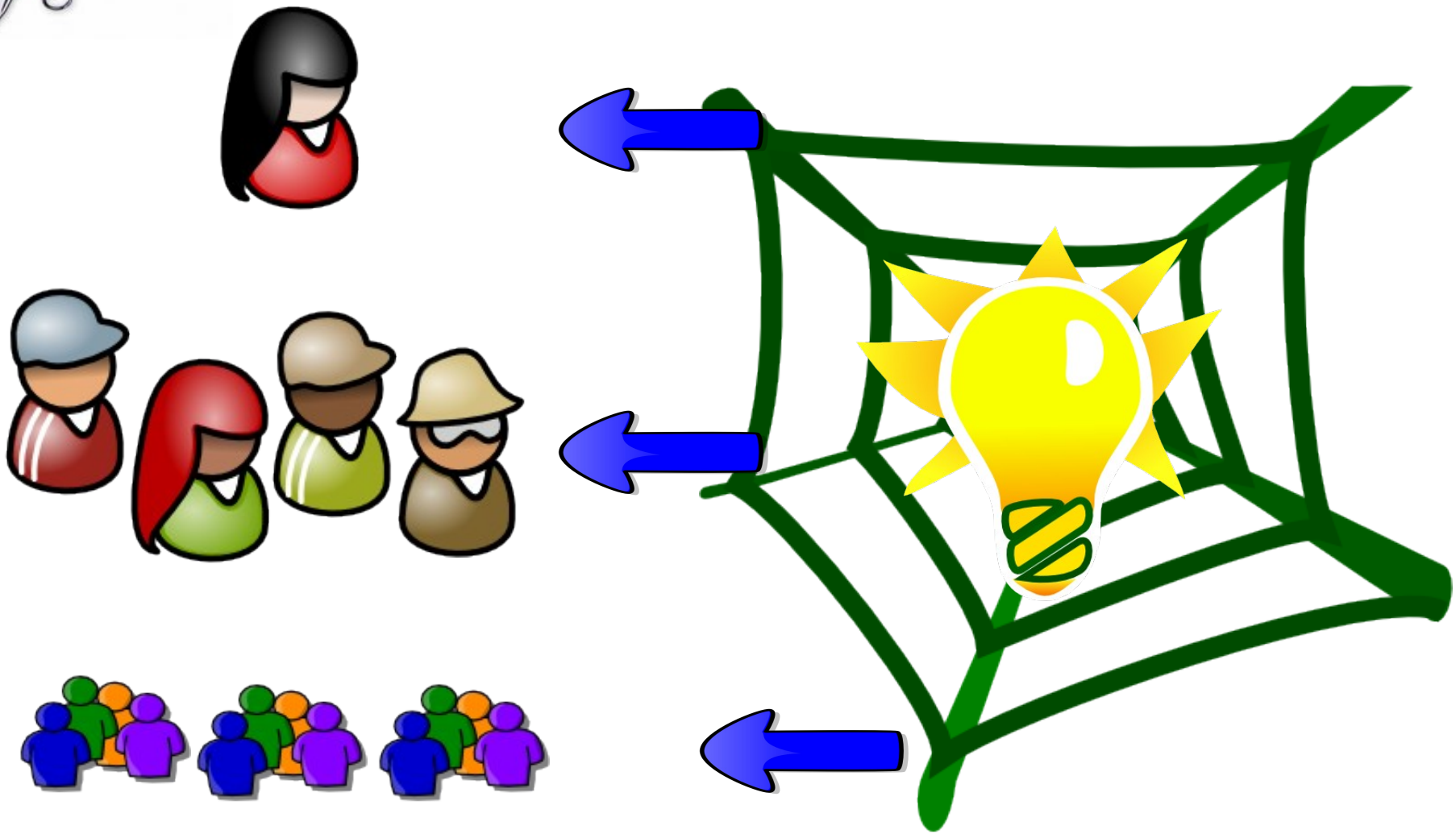
The Idea

The Idea goes public

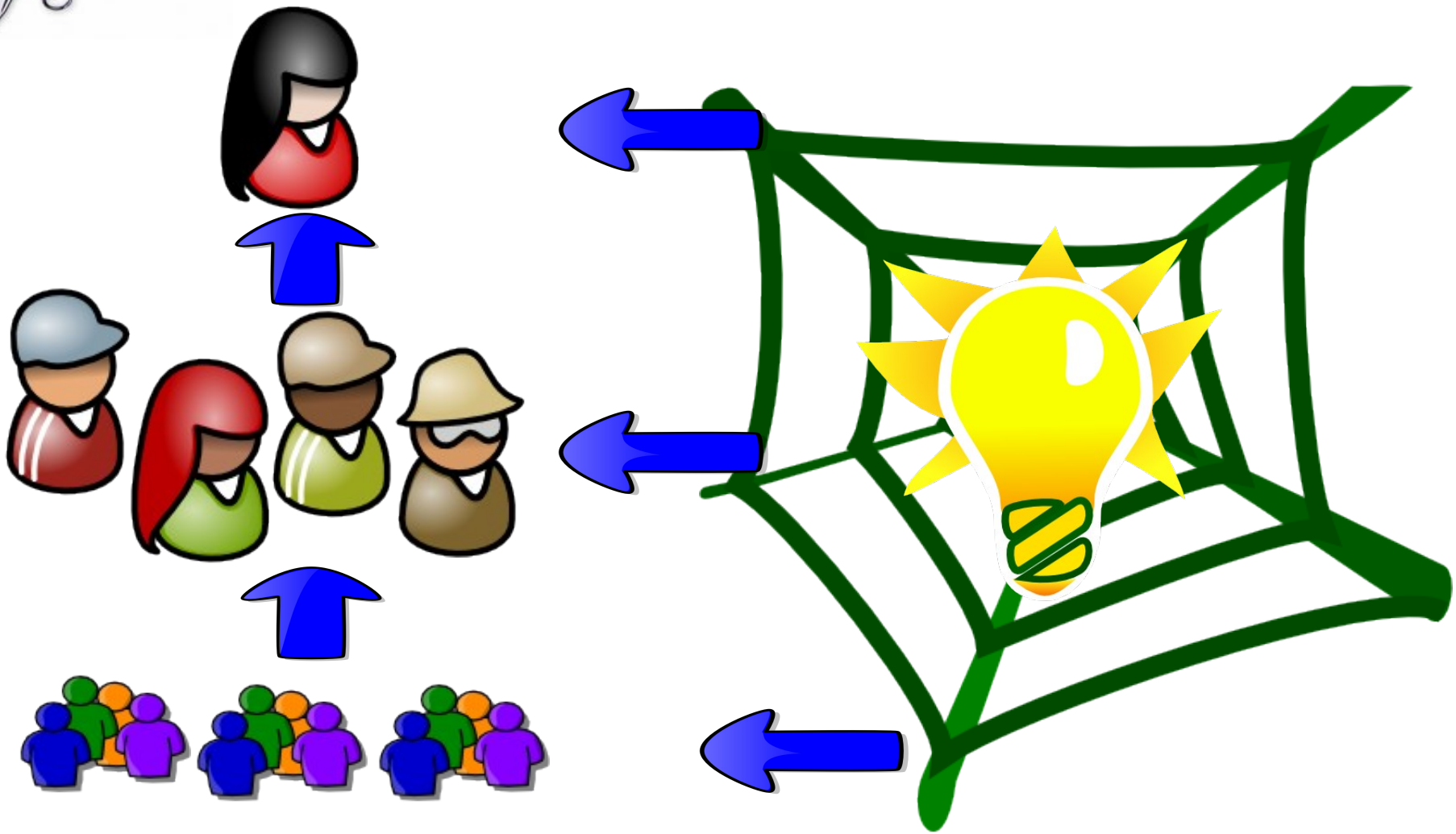


People can see the Idea

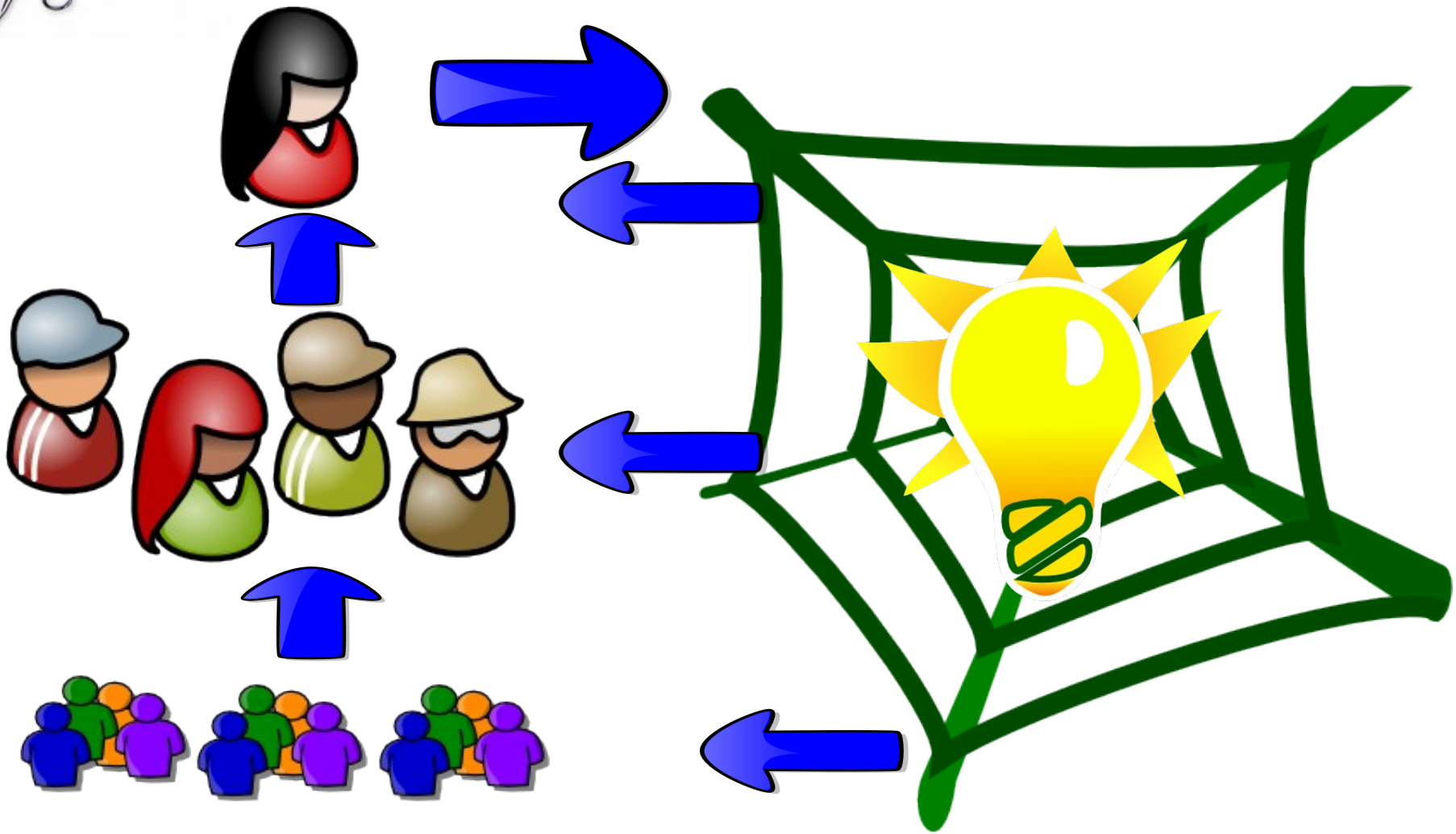
Get the Idea



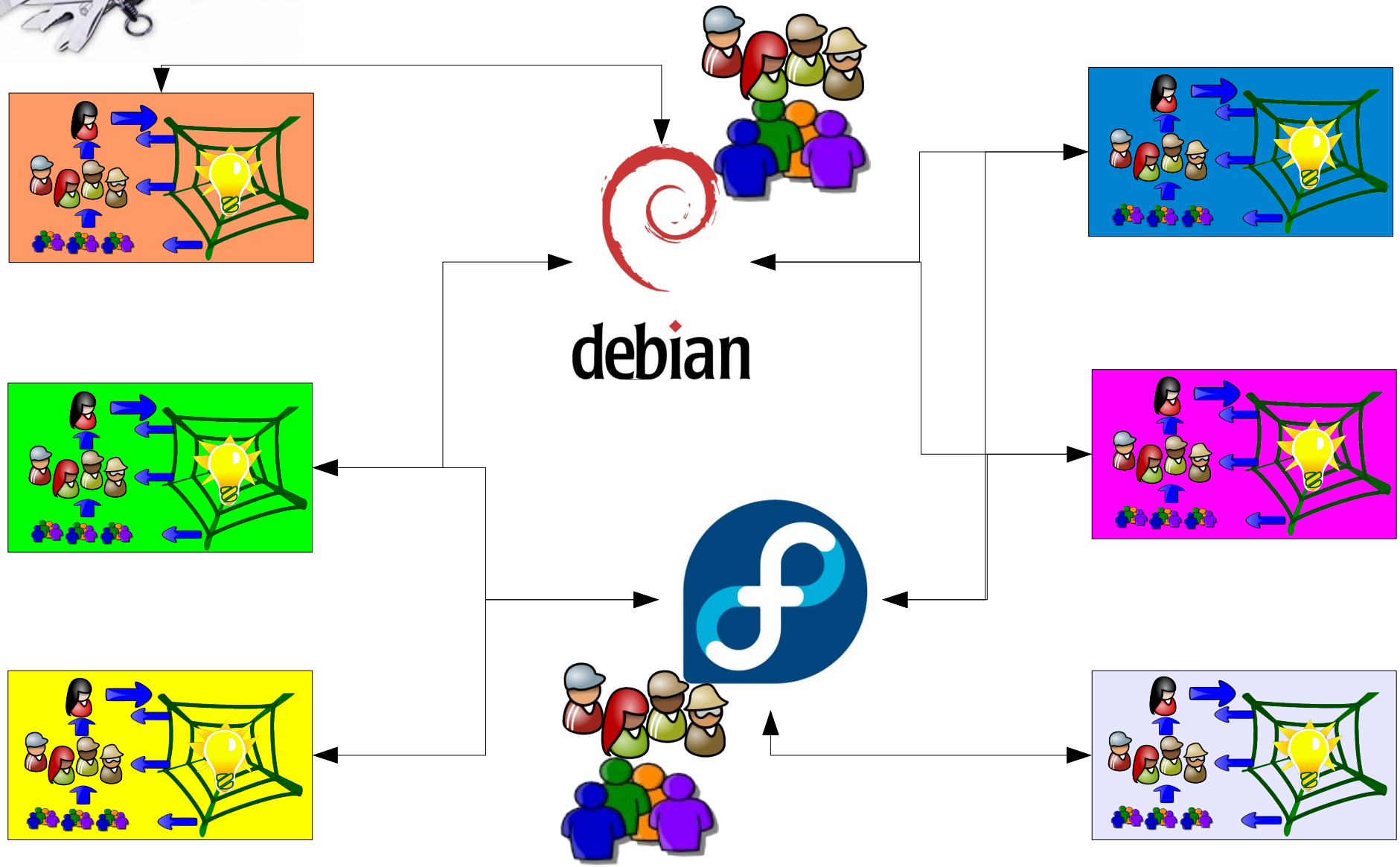
And contribute to the Idea



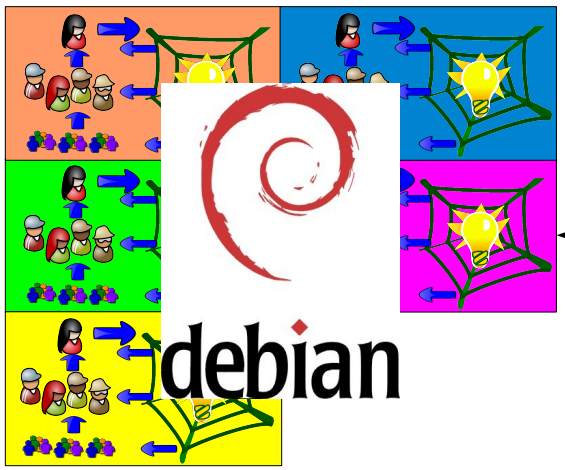
So the Idea can evolve

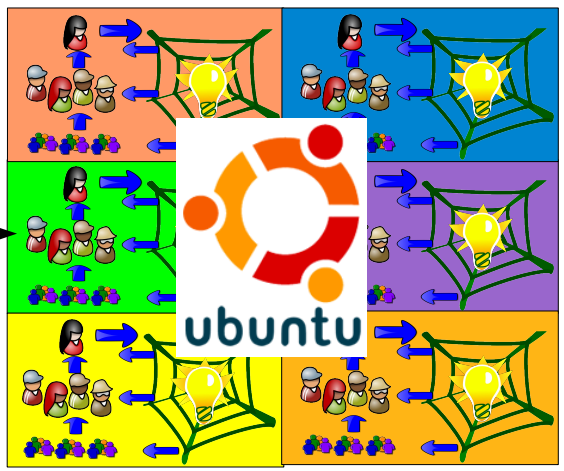


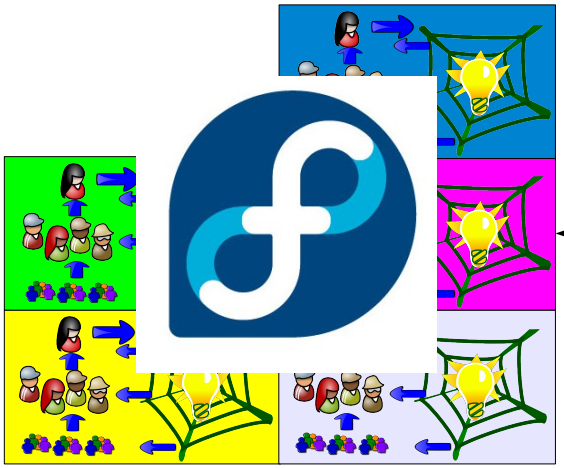
Community distributions

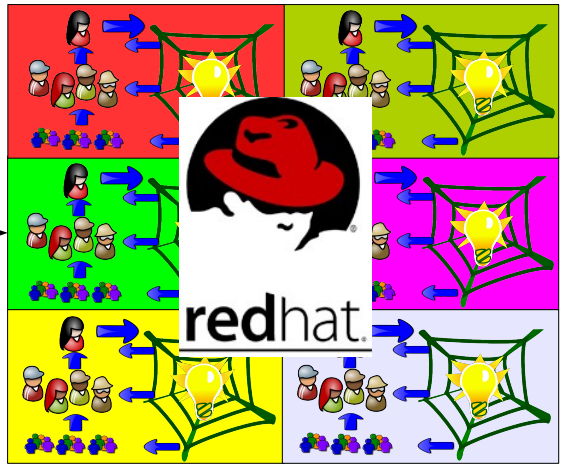


Commercial distributions









Local User Groups

FOSS is an ecosystem of **people...**

- Projects
- Community distributions
- Commercial distributions
- Local User Groups
- Industry
- Users and innovators
- Advocates

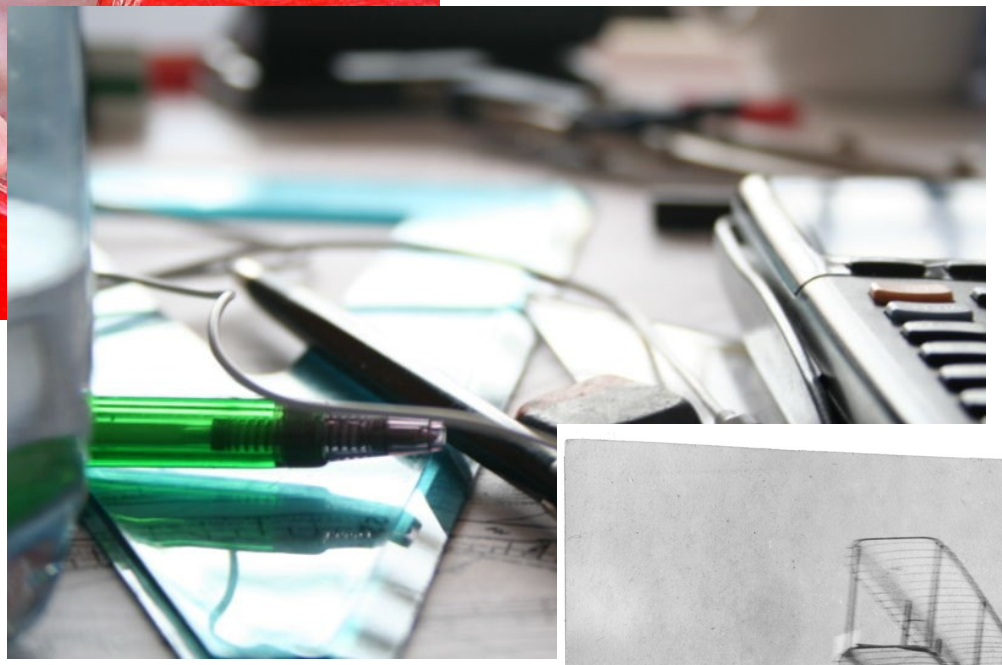
… who **do** stuff

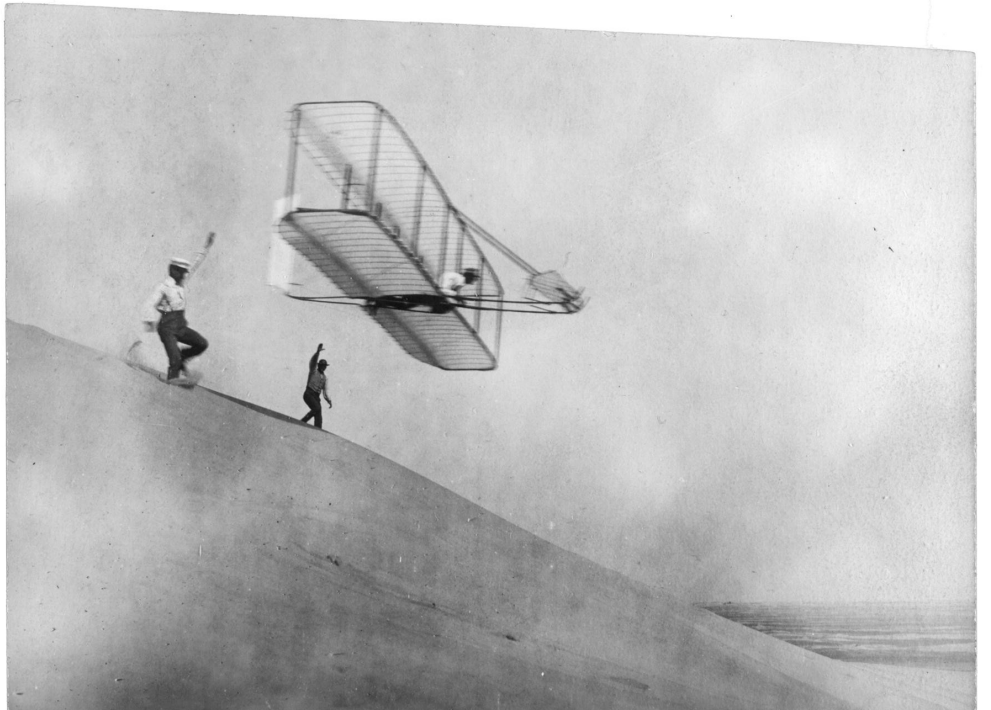
- Software development
- Support
- Documentation
- Implementation
- Demos and talks
- User meetings
- Outreach events

Many do it for fun

Many do it
for work

Many do it to
improve the world

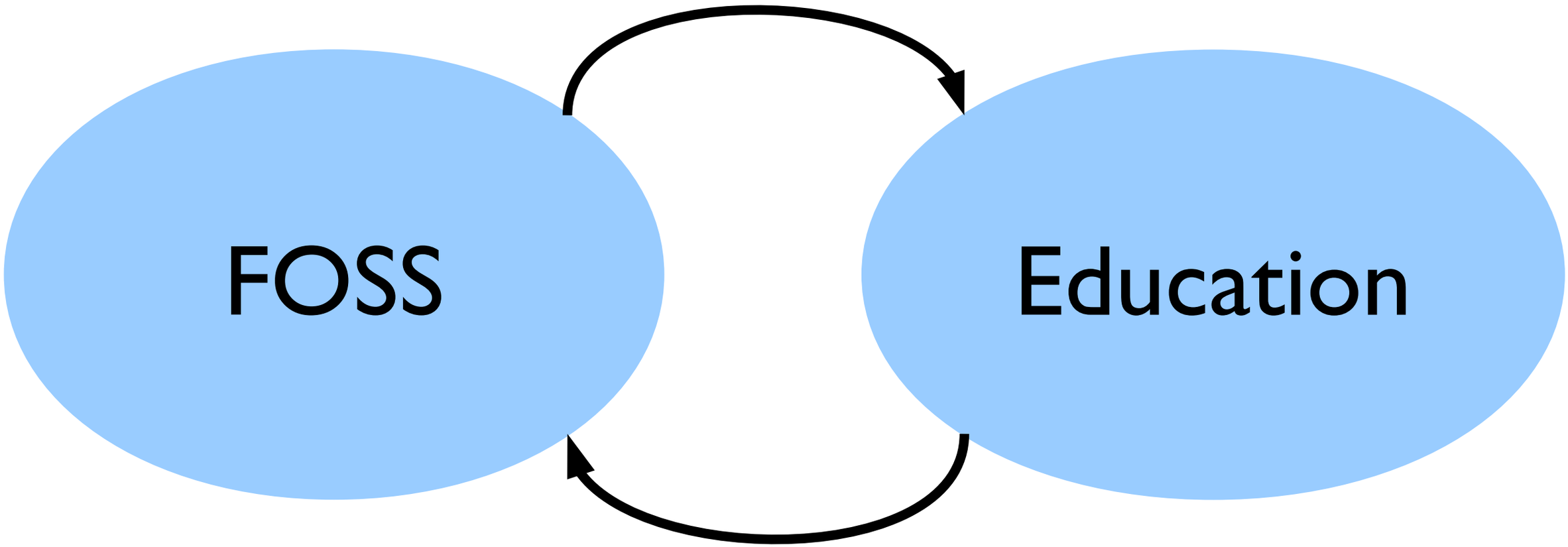




Communities are driven by

- Individuals
- Technical needs
- Vision
- Grassroot efforts

FOSS & Education



“Open Source Sadly wasn't growing...”

Chris DiBona

“We were seeing the same people...
a little older,
a little fatter,
a little grayer...”

Chris DiBona

O'REILLY OSCON Open Source Convention

The Lost Arts...

Terminal

File Edit View Terminal Help

```
Dump of assembler code for function main:
0x00000000008f17c1 <main+0>:    push   %rbp
0x00000000008f17c2 <main+1>:    mov    %rsp,%rbp
0x00000000008f17c5 <main+4>:    push   %r12
0x00000000008f17c7 <main+6>:    push   %rbx
0x00000000008f17c8 <main+7>:    sub    $0x150,%rsp
0x00000000008f17cf <main+14>:   mov    %edi,-0x144(%rbp)
0x00000000008f17d5 <main+20>:   mov    %rsi,-0x150(%rbp)
0x00000000008f17dc <main+27>:   mov    0x1ada215(%rip),%rax        # 0x23cb9f8
0x00000000008f17e3 <main+34>:   add    $0x1,%rax
0x00000000008f17e7 <main+38>:   mov    %rax,0x1ada20a(%rip)        # 0x23cb9f8
0x00000000008f17ee <main+45>:   mov    $0x4000000000000000,%rax
0x00000000008f17f8 <main+55>:   mov    %rax,-0x38(%rbp)
0x00000000008f17fc <main+59>:   movl   $0x0,-0x14(%rbp)
0x00000000008f1803 <main+66>:   movl   $0x0,-0x18(%rbp)
0x00000000008f180a <main+73>:   lea    -0x110(%rbp),%rax
0x00000000008f1811 <main+80>:   mov    %rax,%rdi
0x00000000008f1814 <main+83>:   callq  0x90334e <vector>
0x00000000008f1819 <main+88>:   mov    0x1ada1e0(%rip),%rax        # 0x23cba00
0x00000000008f1820 <main+95>:   add    $0x1,%rax
0x00000000008f1824 <main+99>:   mov    %rax,0x1ada1d5(%rip)        # 0x23cba00
0x00000000008f182b <main+106>:  callq  0x8f60e4 <_Z13RegisterTestsv>
0x00000000008f1830 <main+111>:  mov    0x1ada1d1(%rip),%rax        # 0x23cba08
0x00000000008f1837 <main+118>:  add    $0x1,%rax
0x00000000008f183b <main+122>:  mov    %rax,0x1ada1c6(%rip)        # 0x23cba08
0x00000000008f1842 <main+129>:  lea    -0x40(%rbp),%rax
0x00000000008f1846 <main+133>:  mov    %rax,%rdi
0x00000000008f1849 <main+136>:  callq  0x8effc8 <_ZNSsC1Ev@plt>
0x00000000008f184e <main+141>:  cmpl   $0x1,-0x144(%rbp)
---Type <return> to continue, or q <return> to quit---;3~
```

Finished Spiffy Products...

Xamlon - Microsoft Visual Studio

File Edit View Project Build Debug Data Format Tools Test Window Help

Debug | Any CPU

Window1.xaml* | Window1.xaml.cs | Start Page

Toolbox | Server Explorer | Property Manager | Solution Explorer | Properties

100%

Window1

278

262

Design | XAML

```
<Window x:Class="Xamlon.Window1"
    xmlns="http://schemas.microsoft.com/winfx/2006/xaml/presentation"
    xmlns:x="http://schemas.microsoft.com/winfx/2006/xaml"
    Title="Window1" Height="300" Width="300">
    <Grid>
        <UniformGrid Margin="71,19,68,111" Name="uniformGrid1">
            <StackPanel Height="93" Name="stackPanel1" Width="120" />
        </UniformGrid>
```

UniformGrid (uniformGrid1) Window/Grid/UniformGrid

Output | Task List | Error List | Bookmarks | Command Window | Object Test Bench

Ready | Ln 6 | Col 10 | Ch 10

“Finished products are for decadent minds.”

Isaac Asimov
“The Foundation”

Freshman Year Laptop

Lenovo T410

http://www.rpi.edu/laptops/laptops10/specs10.html

Proprietary Candy

- Microsoft **Windows** 7 Enterprise
- Microsoft **Office** Professional 2010
- Microsoft **Visual Studio** 2010
- Maplesoft **Maple** symbolic algebra program
- MathWorks **MATLAB**
- National Instruments **LabVIEW**
- Siemens **NX CAD** package
- **MapInfo** Professional
- Bentley Microstation
- Adobe Digital Collection (**Photoshop** and **Acrobat** Professional)
- Symantec anti-virus software suite

http://www.rpi.edu/laptops/laptops10/specs10.html

Proprietary Candy

- MIT
  http://ist.mit.edu/services/software/vsls
- Caltech
  http://imss.caltech.edu/cms.php?op=wiki&wiki_op=view&id=19
- Cornell
  http://cusoftware.cornell.edu/cusoftware/purchase/index.cfm
- Stanford
  https://itservices.stanford.edu/service/ess
- UC Berkeley
  http://software-central.berkeley.edu/
- CMU
  http://www.cmu.edu/computing/software/all/index.html

Proprietary Candy

- JHU
  http://www.sais-jhu.edu/it/students/hopkins-it-programs.htm
- UCSC
  http://its.ucsc.edu/service_catalog/software_licensing/
- College of Charleston
  http://www.cs.cofc.edu/software.php

The Walled Garden...

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OSCON
Open Source Convention

The Walled Garden...

- You can use this all this software, but ...
- Only from inside Rensselaer network
- Reverse Engineering is **Forbidden** !!
- Once your four years finish.... you learn the real price

In the absence of FOSS...

12 Things that They will NOT Know

- The Difference between Compiling, Archiving and Linking
- The Command Line
- Memory Allocation
- Code Coverage
- Memory Leaks
- Sockets
- Revision control (CVS / SVN / Git)
- Drivers
- Reverse engineering file formats
- Management of large software systems (> 1000 LOC)
- Debugging past the system barriers
- Shell Scripting

With FOSS...

How Stuff Works...

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Take it apart...

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OSCON
Open Source Convention

Put it back together...

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Only then
you will reach
Enlightenment...

1) The financial interests of students must be taken into account when we propose curriculum modifications.

2) The benefits / drawbacks of every approach should be based on experimental evidence that must be verifiable by third parties.

Other opinions...

1) Using proprietary tools do not necessarily prevent students from learning specifics of "how things work".

2) In some cases open source tools are better aligned with the financial interests of students.

Other opinions...

OpenCourseWare

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- You are free to Reuse
- You are free to Remix
- As long as you credit the author

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Economics

Free Market...

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Copyrights...

Patents...

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Software Patents...

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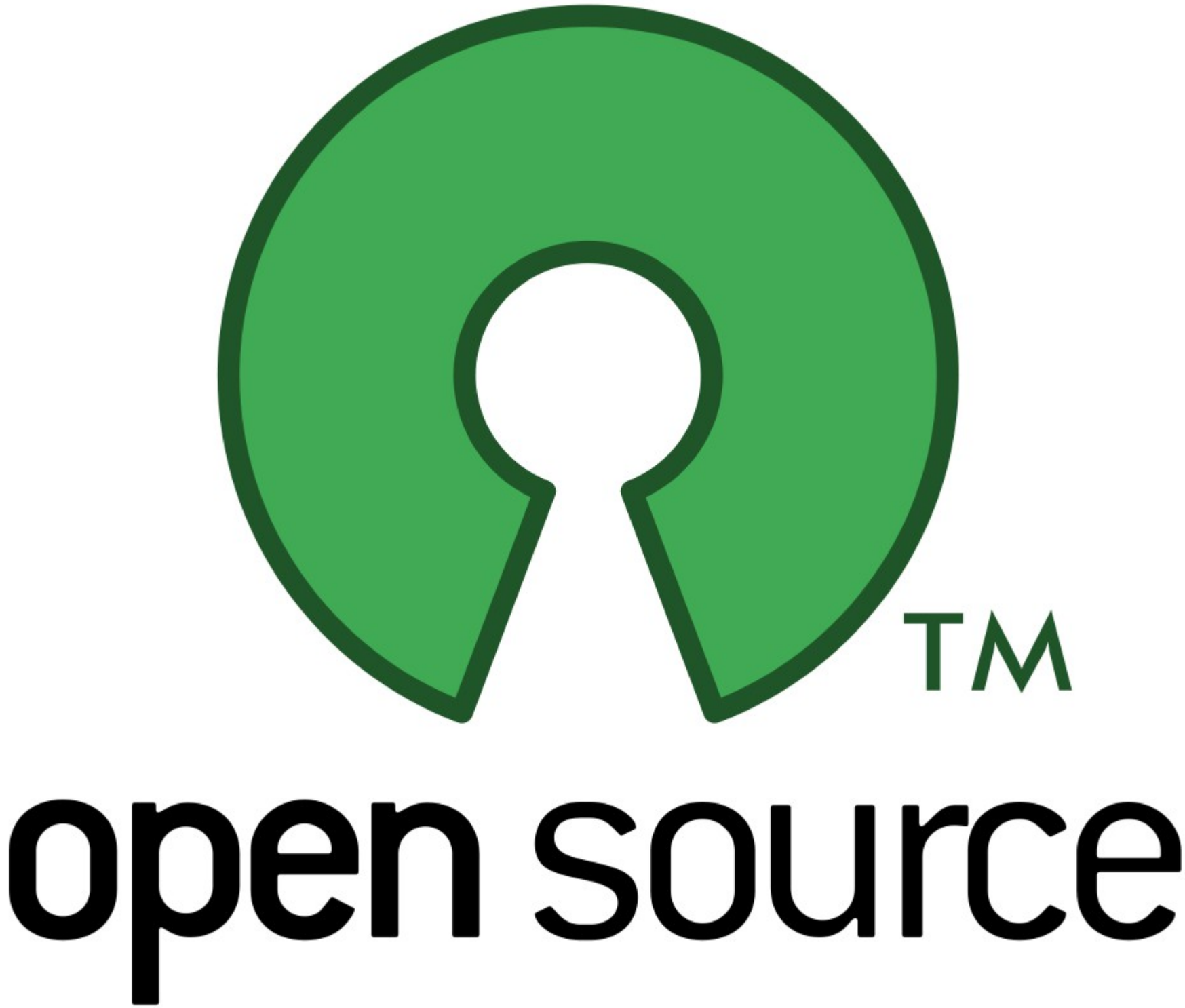

FOSS Licensing...

Case Studies...

Wikipedia & Peer-production...

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OPEN ACCESS

Open Access Publishing...

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Software Process & QA...

Business Models...

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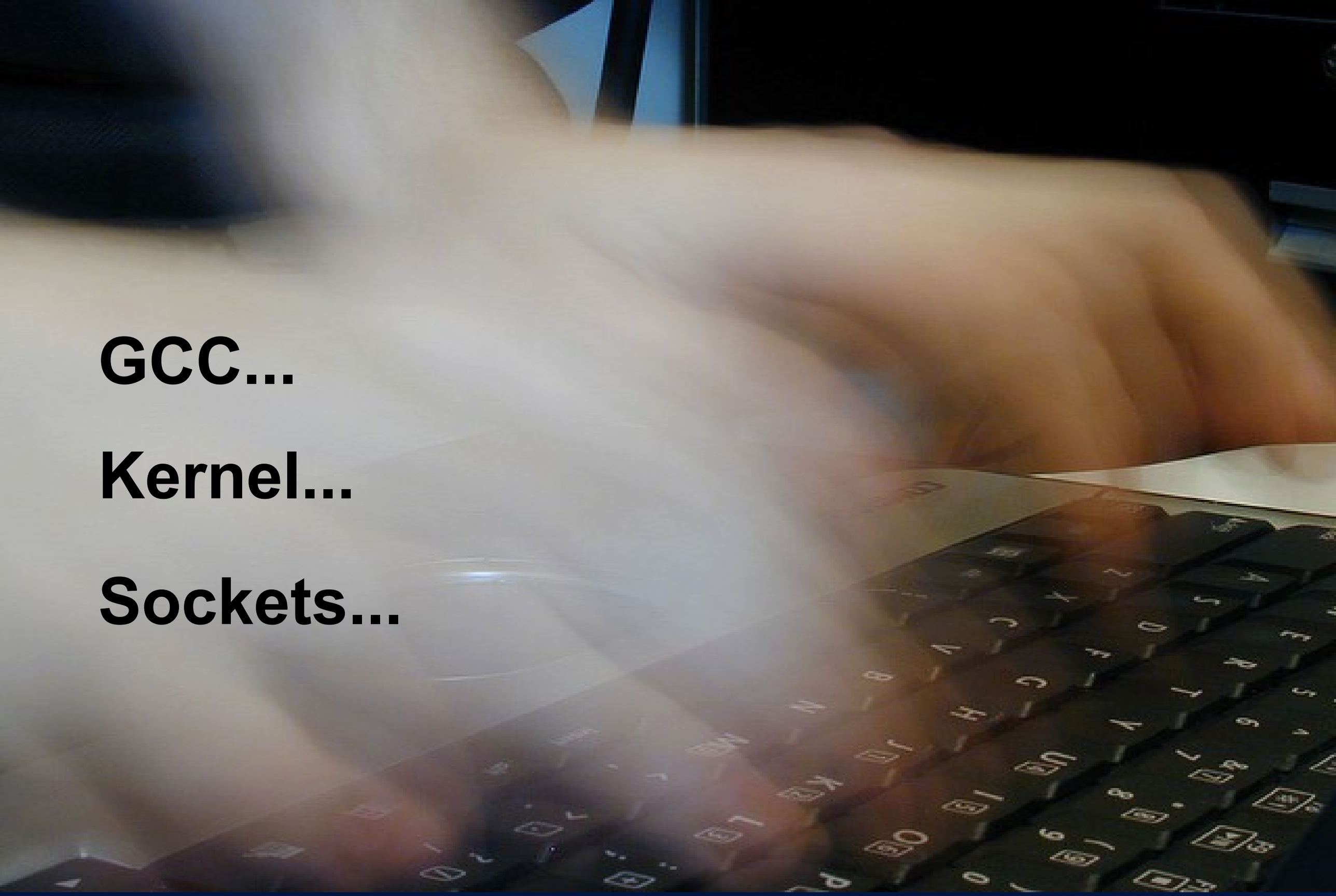


GCC...

Kernel...

Sockets...

Observations...

Teaching a FOSS Course

- Diverse level of student skills (Power distribution)
- Students have been trained **NOT** to copy from each other...
- Teaching Freedom without Coercion...

Students are used to Structure

- Tell me about my grades
- What's my homework ?
- Will **this** be in the test ?
- How do I do well in this course
- How much is enough ?

Replicating an FOSS community inside a classroom

- Asking people to take Initiative ?
- Controlled chaos ?
- Personality clashes
- The long tail : how to grade small efforts ?
- Triggering emergence of self-organization
- Motivating people
- Meritocracy

Finding a FOSS project to work on

- Social aspects
  (a lot of FOSS is not about Technology...)
- Joining a community can be tricky
- Not all communities are prepared to accept newcomers
- Small contributions vs Large contributions
- Easier to start a project from scratch than to join an existing project.

What is FOSS?

- FOSS stands for **F**ree **O**pen **S**ource **S**oftware
- Free as in freedom, not necessarily price
- Free Software and Open Source software are usually the same, but the motivations are different – (will be discussed next)

History

- No restrictions on software till late 1970s
- Richard Stallman founded the Free Software Foundation and the GNU project in 1984
- Linus Torvalds starts the Linux project and releases the first version in 1991, under the GPL licence.
- Eric Raymond publishes 'The Cathedral and the Bazaar', coins the term 'Open Source'
- Influenced by this, Netscape opens its browser source code, founding the Mozilla project

Free vs. Open Source

- Free software movement is more concerned with user's freedoms.
- Open Source is more about the shareability of the code. More enterprise-friendly
- BSD license is regarded as non-free, yet open source.

Free vs. Open Source (2)

- Basic freedoms in Free Software:
  - The freedom to run the program, for any purpose
  - The freedom to study how the program works, and change it to make it do what you wish. Access to the source code is a precondition for this.
  - The freedom to redistribute copies so you can help your neighbour
  - The freedom to improve the program, and release your improvements (and modified versions in general) to the public, so that the whole community benefits. Access to the source code is a precondition for this

Free vs. Open Source (3)

- Open Source Definition
  - Free Redistribution
  - Access to source code
  - Permitting Derived Works
  - Integrity of The Author's Source Code
  - No Discrimination Against Persons or Groups
  - No Discrimination Against Fields of Endeavor
  - Distribution of License
  - License Must Not Be Specific to a Product
  - License Must Not Restrict Other Software
  - License Must Be Technology-Neutral

Famous FOSS projects

- Linux kernel
- Apache Web server
- OpenJDK
- BSD operating systems (not Free but Open Source)
- Eclipse
- PHP
- Mozilla Firefox

Why use FOSS?

- The availability of the source code.
- The right of code modification, improvement and redistribution.
- No black box.
- Have an alternative.
- Low cost software (TCO).
- Free marketing and support for your project.
- Quick improvement.
- Large base of developers and users.
- Decreased number of open defects. (We should report bugs)

Why use FOSS?

- For you - as a student - FOSS is an **immensly** benficial educational tool.

- Suggestion: A good idea is to integrate it within our educational curricula.

ubuntu

FOSS Licences

- Hundreds of licences are available for FOSS
- FSF-approved licenses: http://www.gnu.org/licenses/license-list.html
- OSI-approved licneses: http://opensource.org/licenses
- Most licences are approved by both.
- We'll concentrate on GPL, LGPL, and BSD licences

GPL

- GPL stands for **G**eneral **P**ublic **L**icense
  - Most famous, and most commonly used
  - Grants most freedoms for users
  - Most demanding in terms of guaranteeing those freedoms
  - Not very enterprise-friendly
  - Guarantess project-viability nevertheless

LGPL

- LGPL stands for **L**esser **G**eneral **P**ublic **L**icence
  - Almost the same as GPL with less restrictions
  - Designed mainly to be a licence for libraries
  - Allows non-free applications to link against the LGPL-licences software

BSD Licence

- BSD Licence was first used by BSD OSs
  - Less restriction on derived works
  - BSD network stack modified and closed by Microsoft in NT systems due to the relaxed restrictions
  - Can be regarded as more enterprise-friendly
  - Not FSF-approved but OSI-approved

Dual Licencing

- Some companies choose to release their software with multiple licences
- This way they can leverage having a diverse developer community, yet also have the perceived benefits of closed-source distribution and licencing
- Example
  - Until recently, Qt – a C++ GUI library – had an open source edition released under the GPL, and a commercial edition that contains additional libraries -e.g. Libraries to access commercial DBs such as Oracle and MS SQL, which are not covered under the GPL

FOSS in The Industry

- Linux represents 12.7% of the overall server market share.

  Source: http://www.linux-watch.com/news/NS5369154346.html

- Other estimates 60% share of the server market

  Source: http://www.pcworld.com/businesscenter/article/151568/ballmer_still_sear

- Nevertheless, Linux has a great market share of Supercomputers, cloud computing providers, and embedded devices

FOSS in The Industry (2)

- Mozilla Firefox has celebrated a billion downloads on July 2009.
- Reported to have more than 20% of the market share
  - Source: http://marketshare.hitslink.com/firefox-market-share.aspx?qprid=0&samp

FOSS in The Industry (3)

- Apache web server accounts for 47% of all webservers
  - Source: http://news.netcraft.com/archives/2009/06/17/june_2009_web

Why people contribute to FOSS

- Most of OSS developers are paid, one way or another.
- Peer-recognition
- Personal Learning
- Use in personal projects
- Companies invest in the project to deliver it to a customer
- Provide training and support.

Why people contribute to FOSS

You should contribute too! ;)

Module 1.1

General FLOSS Concepts

The Free Software and Open Source Foundation for Africa

Capacity Building International Germany

What is FLOSS

- Free/Libre and Open Source Software
- “It is all about FREEDOM”: It can be:

  - An ethical choice
  - A resource
  - A better alternative
  - An enemy
  - Just another jargon
  - An ideal
  - A business model
  - An industry
  - A philosophical argument
  - A social movement
  - A development methodology
  - A service

What is FOSS to you?

Freedoms in Free Software

- "Free software" is a matter of **liberty**, not price. To understand the concept, you should think of "**free**" as in "**free speech**," not as in "**free beer**"
  - Richard Stallman

- freedom 0:Run the program, for any purpose.
- freedom 1:study how the program works, and adapt it to your needs.
- freedom 2: Redistribute copies to help others.
- freedom 3: improve the program, and release your improvements to the public

What are the preconditions to freedoms 1 & 3?

Preconditions for Freedom: Licensing

- Access to source code is fundamental in FOSS
- There are a number of FOSS licenses ....
- .... which are *almost* similar on practical terms

- Examples of FOSS Licenses:
  - GNU General Public License (GPL)
  - BSD-style licenses
  - Mozilla Public License (MPL)

Does providing source code make a software Open Source?

FOSS vs Proprietary

- FOSS:
  - community benefit motive
  - Access to source code
  - Freedom to modify
  - Freedom to redistribute
  - Freedom to study
  - Freedom to use it for any purpose
- Proprietary software:
  - commercial benefit motive
  - No/Limited access source
  - You may not modify
  - You may not redistribute
  - You may not study it
  - You may not use for any other purpose other than the one it was made for.

Can you make money in FOSS as you can in proprietary?

The Linux Story - Movie

- Watch the first 19.41 minutes of the movie “Revolution OS”:
  - http://video.google.com/videoplay?docid=7707585592627775409

- Identify the key learning points based on the following:
  - Motivation for establishing a FOSS project
  - Requirements of a hacker
  - What is the FOSS hacker philosophy
  - Role of Management
  - Role of community
  - Access to computing resources and the Internet

FOSS vs Proprietary – a bizview

Access code, 'free' download, reuse	Buy – don't build or code
Freedom to modify	Vendor locking
Customize to one's needs	Lack of customisable features
Ease of localization	Deployed for limited locale(regions & languages)
Extrinsic & Intrinsic motivation	Extrinsic motivation
Generation of shared knowledge 4 common good	Generate knowledge for competitive advantage
Distributed support	'Singularity' in support
Ease of compliance	Difficult to comply

What feature/attribute will be more appealing for your business?

Extreme imaginations, demystifying the myths (1)

- It's a Linux vs Window thing
  - > 400, 000 FOSS projects
- Floss is not reliable or supported
  - More reliable, better supported especially in major FOSS solutions
- Big companies don't use FLOSS
  - HP, SUN, IBM, Oracle, UWC, UEM..... promote FOSS
- FLOSS is hostile to IP
  - Licenses are based on copyright law(s)
- There is no money to be made in FOSS
  - Get facts right – HP $2.5B in 2003, Redhat $400M in 2006

Extreme imaginations, demystifying the myths (2)

- FLOSS movement is unfair and unsustainable
  - >50% of FOSS developers are paid others are intrinsically motivated
- If you start a FOSS project, many developers will work for you for nothing
  - Community growth requires significant investment
- FLOSS is for the geeks, the programmers
  - Never, it is for solving real problems for ordinary people
- FLOSS is always steps behind proprietary software
  - Innovative index is almost parallel at 12%, probably more for FOSS at the user level

What are some of the myths about FOSS being propagated in your environment?

The Free Software and Open Source Foundation for Africa
Capacity Building International Germany

Exercise One: Examples of FOSS

- Visit the Free Software Portal's Category section and list at least five categories of software that you have used or heard of in the last year.
- In each category, list at least one software you would want to use before the end of the training period
  - http://en.wikipedia.org/wiki/Portal:Free_software/categories
  -

What software categories do you think would be suitable for your context? why?

Module 1.2

FIOSS Business Globally

The Free Software and Open Source Foundation for Africa

Capacity Building International Germany

FOSS as an Industry/Business

- Driven by profits or generating revenue (How)
  - Contracted product support e.g. Mail Server support for an organization, Linux support
  - Contracted software development e.g. by governments
  - Consulting
  - Data handling and management
  - Hosting
  - Training
  - Certification
  - Migration
  - **And many more....**

What other ways can you use FOSS to generate revenue?

FOSS for e-Learning – A case

- Pre-production
- Production
- Post-production
- Distribution

Pre-production

- Office Suites
  - OpenOffice
  - NeoOffice (for Mac)
- Mind Mapping
  - Freemind
- Browser
  - Firefox
- Email Client
  - Thunderbird

Production

- Audio recording
  - Audacity
- Video recording
  - VirtualDub
  - Blender (for linux)
- Content Authoring
  - ExeLearning
- Image editing
  - GIMP

Post-Production

- CD Compilation
  - cdrtools

- Video Encoder
  - Media Coder

- PDF
  - PDFCreator, PDFedit, PdfTeX, Pdfre-cycle, Pdftk, Pdftotext

Distribution

- Wikis
  - MediaWiki
- Learning Management Systems
  - Moodle, Sakai, KEWL, Dokeos
- Podcasts
  - Miro(democracy)
- Bittorrents
  - qBitorrent

Help??

FLOSS Manuals (en) - Mozilla Firefox

File Edit View History Delicious Bookmarks Tools Help

http://en.flossmanuals.net/

FLOSS MANUALS

READ WRITE REMIX ABOUT

FREE MANUALS FOR FREE SOFTWARE

I WANT TO PLAY STREAMS

READ

Search

Click on any of the free manuals below to read online. View All, GNU/Linux, Windows, OSX

CRM

CiviCRM (NEW!)

OFFICE

Firefox (MAJOR UPDATE!)

OpenOffice.org

GNU/LINUX

GNU/Linux Commands (also : fi)

GRAPHIC DESIGN

Digital Foundations (also : es)

Alchemy

Inkscape

NET

How to Bypass Internet Censorship

TRANSLATION

Open Translation Tools (NEW!)

Video Subtitling (NEW!)

VIDEO

FREE NETWORK SERVICES

VIDEO SUBTITLING

FLOSS MANUALS bookstore

HOW TO BYPASS INTERNET CENSORSHIP

Inform yourself on how internet censorship works and how to route around it with free software. Includes an excellent overview of the techniques and tools for beginners and advanced users..

Buy Now!

FIREFOX

Learn how to get more from the worlds best browser!

Buy Now!

CIVICRM

A fantastic guide to learning how to use the premier

Done

Opportunities/Areas in FOSS Biz

- Selection/integration
- Migration/Substitution
- New Deployment
- Selling services
- Selling products

Service Matrices and Configurations

- Horizontal
- Vertical
- Hybrid? Eclectic? pragmatic?

Horizontal

	OpenOffice	Freemind	Firefox	Thunderbird
Development				
Installation				
Integration	X	X	X	X
Maintenance & Support				
Training				
Certification				
Migration				

Vertical

	Audacity	VirtualDub	eXe	GIMP
Development		X		
Installation		X		
Integration		X		
Maintenance & Support		X		
Training		X		
Certification		X		
Migration		X		

Eclectic

	MediaWiki	Moodle	Miro	qBitorrent
Development	X	X		
Installation	X	X	X	X
Integration		X		
Maintenance & Support		X		
Training	X			X
Certification	X			
Migration		X		

Exercise Two: Group Case

- Just like the cases identified for use of in eLearning, identify an industry that can use a 'cocktail' of FOSS projects/software in its different phases or departments or functional areas.
- Tabulate the service configuration matrix that you think would fit into the industry given the software you have selected
- Present your table- with reasons for your selection(s).

Module 1.3

Evolution of FLOSS Communities and Software Markets

The Free Software and Open Source Foundation for Africa

Capacity Building International Germany

FLOSS and Communities

- Is there FLOSS without a community?
- How does FLOSS communities change the costs of development, production, copying and distribution?
- What is the value of the network effects?
- What are the challenges of incompatibility in the network?

Is there FLOSS without a community?

How does FLOSS communities change the costs of development, production, copying and distribution?

- Take the example of an Operating System and do a costing based on:
  - Lines of code(LOC)
  - $$/LOC
  - LOC/Developer
  - Cost of distribution
  - Cost of copying
  - Cost of training and modifications
  - .....
  - .....

- How has all this changed?

What is the value of the network effects?

What are the challenges of incompat-ibility in the network?

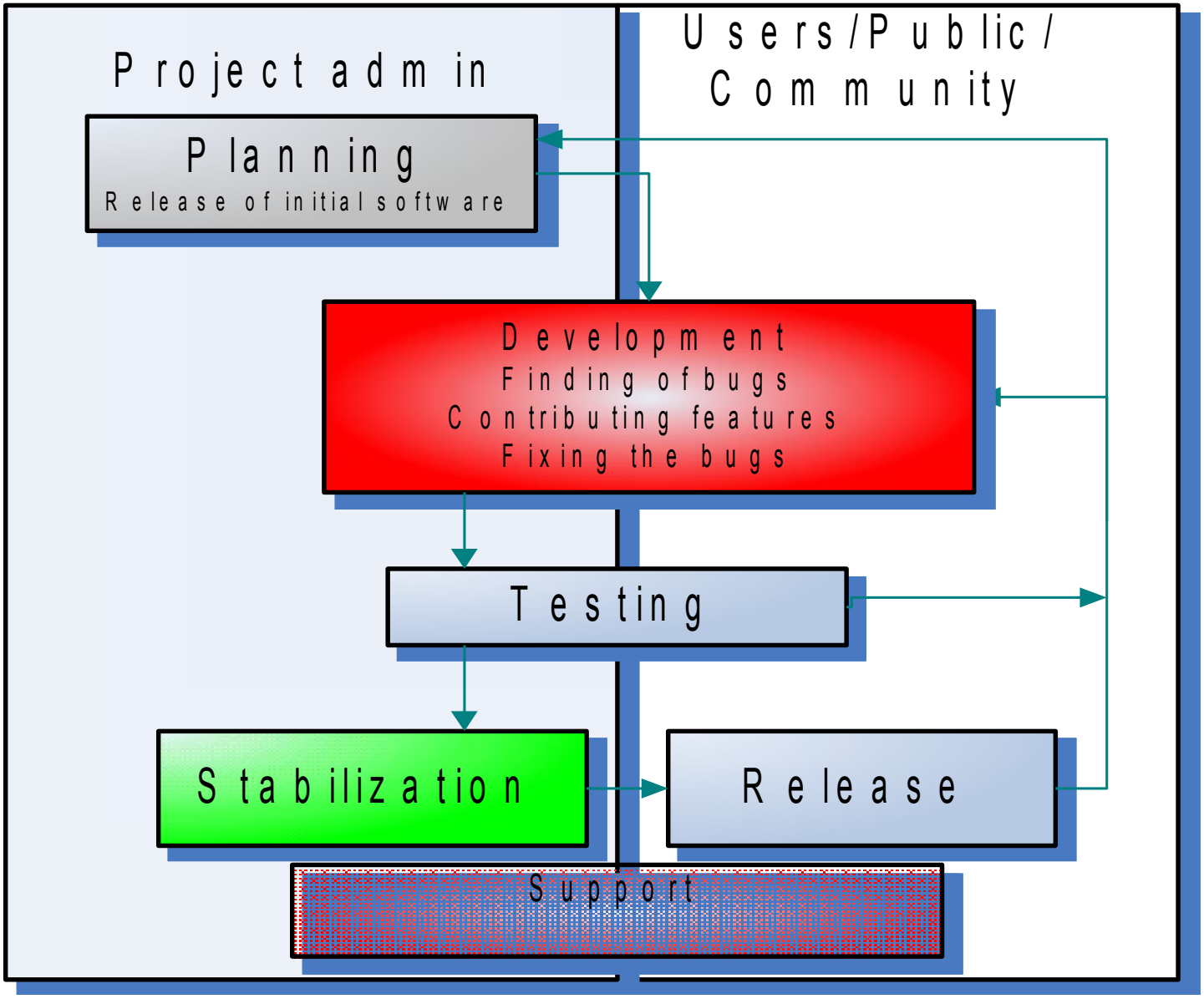
Software market

- Do you think the software markets are saturated?
- Where are the gaps/opportunities in the software market?

Do you think the software markets are saturated?

Where are the gaps/opportunities in the software market?

Exercise Three: Describe how the project admin can benefit from the community from the diagram below



The Free Software and Open Source Foundation for Africa

Capacity Building International Germany

Module 1.4

FLOSS Licensing models

The Free Software and Open Source Foundation for Africa

Capacity Building International Germany

Common Licenses

- The four basic freedoms
  - freedom 0:Run the program, for any purpose.
  - Freedom 1:study how the program works, and adapt it to your needs.
  - freedom 2: Redistribute copies to help others.
  - freedom 3: improve the program, and release your improvements to the public

Terminology

- License or grant license
- Licensor
- Licensee
- Copyright
- Copyright holder
- Copyleft
- End User License Agreement (EULA)

Applying Licenses to FLOSS works

- Develop a software
- Assert copyright ("© James Njenga 2009")
- Decide on HOW to distribute it (As FLOSS)
- Select a FLOSS license that suits you (and your work)
- You distribute your software
  - Either gratis or for a fee

Basic Types of FLOSS Licenses

- Public domain software
  - Copyright expired
  - Not originally copyrighted
  - Author abandoned copyright
- Permissive Licenses
  - Author retains copyright solely to disclaim warranty
  - Require proper attribution of modified works
  - Permits redistribution and modification, even proprietary
- Copyleft e.g GNU GPL
  - Author retains copyright
  - Permits redistribution and modification (Under the same licenses)

Dual Licensing

- License interoperability
- Commercial use of code/software
  - e.g. MySQL
- Flexibility vs “watering down” original FLOSS licenses
- Always look for license that allows for the broadest distribution of your work!

Group Exercise Four

- Visit the link: http://www.fsf.org/licensing/licenses/
- Read on the different kinds of licenses.
- Write a paragraph summary on your understanding of (one per group):
  - GPL-Compatible Free Software Licenses
  - GPL-Incompatible Free Software Licenses
  - Non-Free Software Licenses
- Additional resource: http://en.wikibooks.org/wiki/FOSS_A_General_Introduction/Intellectual_Property_Rights_and_Licensing