



# Linux Kernel Hacking 101

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For the Linux Foundation

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2014

**FREE & OPEN SOURCE SOFTWARE**  
**Outreach Program for Women Internships**  
organized by the GNOME Foundation

**LOOKING FOR AN INTERNSHIP**  
**DEC 2014 - MAR 2015?**

**MAKE A DIFFERENCE!**  
**Support software freedom!**

**DEC 9 - MAR 9**  
**PROGRAM DATES**

**OCT 22**  
**APPLICATION**  
**DEADLINE**



**\$5500**  
**STIPEND (USD)**

**GNOME.ORG/OPW**  
**LEARN MORE**  
**& APPLY!**

**FREE & OPEN SOURCE ORGANIZATIONS THAT PARTICIPATED IN THE PAST INCLUDE:**



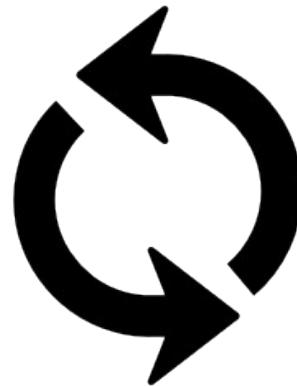
**Use your skills in programming, design, documentation,**  
**or marketing, working with an experienced mentor.**

.....  
**Work remotely from home while collaborating within**  
**a world-wide free & open source software community!**

**Open to all interested women (cis and trans) and genderqueer available for a full-time internship.**

The process of kernel hacking is a

CYCLE



# The Creative Cycle

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- Code your changes
- Send in your patch
- Gather feedback
- Repeat

# The Creative Cycle

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- Find a contribution to make

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# The Creative Cycle

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- Find a contribution to make
  - Read stored communications
  - 
  -

# The Creative Cycle

---

- Find a contribution to make
  - Read stored communications
  - Gain experience
  -

# The Creative Cycle

---

- Find a contribution to make
  - Read stored communications
  - Gain experience
  - Ask



# The Creative Cycle

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- Code your contribution
- Prepare and send the patchset

# The Creative Cycle

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- Gather feedback

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# The Creative Cycle

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- Gather feedback

- Testing results

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# The Creative Cycle

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- Gather feedback
  - Testing results
  - Mentoring and guidance
  - 
  -

# The Creative Cycle

---

- Gather feedback
  - Testing results
  - Mentoring and guidance
  - Discussion of strategies
  -

# The Creative Cycle

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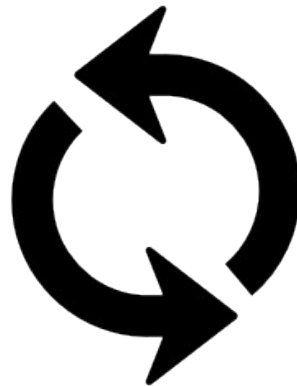
- Gather feedback
  - Testing results
  - Mentoring and guidance
  - Discussion of strategies
  - General suggestions

# The Creative Cycle

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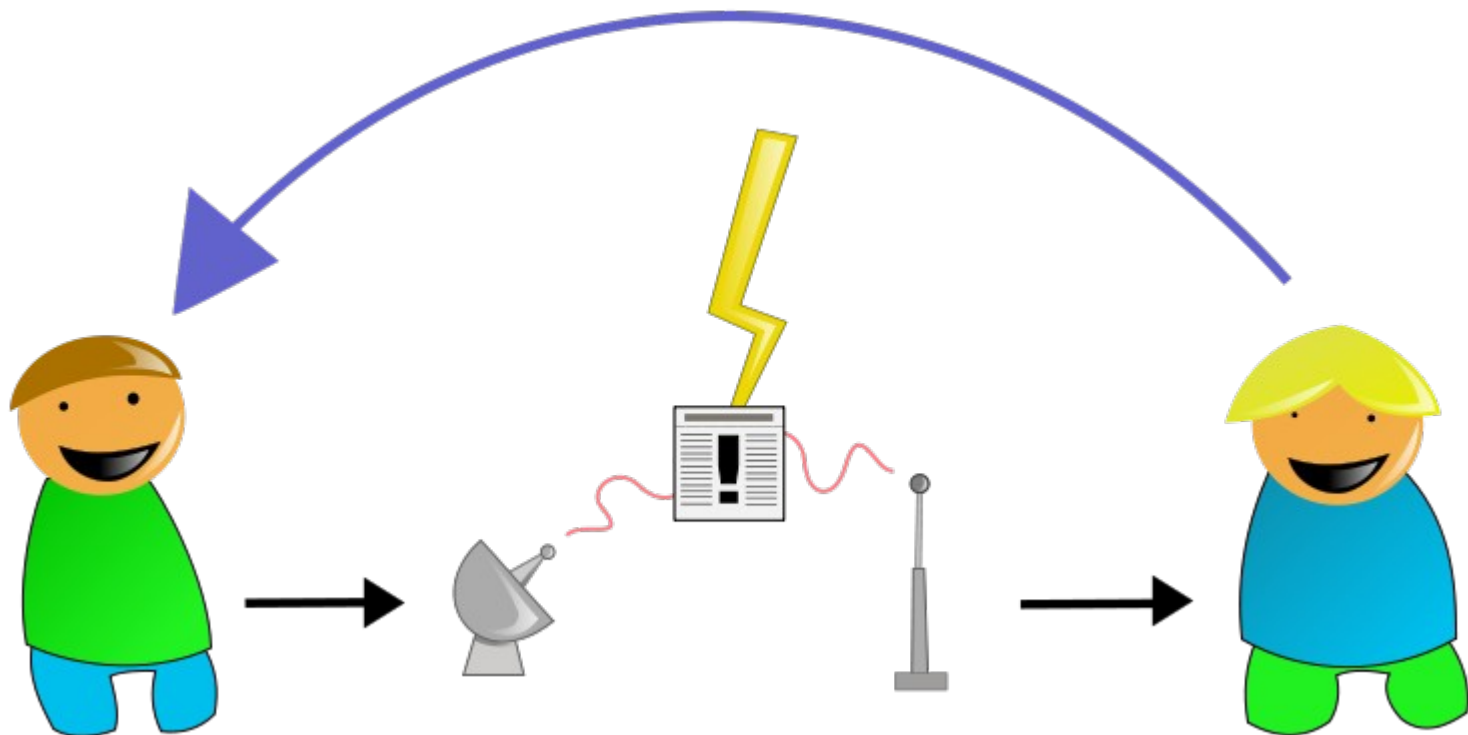
- Incorporate changes
  - Use feedback to improve
  - If your contribution is rejected, find another
- Regenerate and resend your patchset

Repeat the previous two slides until  
Your patchset is accepted...  
Then repeat with a new patchset...





# Communicating with team members and community



# Communicating

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- Mailing lists



# Communicating

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- Mailing lists
- Private email
- 
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# Communicating

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- Mailing lists
- Private email
- Conferences
-

# Communicating

---

- Mailing lists
- Private email
- Conferences
- Linux Weekly News

# Communicating

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- Internet Relay Chat (IRC)

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# Communicating

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- Internet Relay Chat (IRC)
  - Looks like multi-way text messaging

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# Communicating

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- Internet Relay Chat (IRC)
  - Looks like multi-way text messaging
  - Use a dedicated client (not a web client)
  - 
  -



# Communicating

---

- Internet Relay Chat (IRC)
  - Looks like multi-way text messaging
  - Use a dedicated client (not a web client)
  - Connect to a network
  -

# Communicating

---

- Internet Relay Chat (IRC)
  - Looks like multi-way text messaging
  - Use a dedicated client (not a web client)
  - Connect to a network
  - Once on the network, join a channel

```
Terminal — xaric — 80x40

*** Triddle n=tyler@c-24-20-181-30.hsd1.wa.comcast.net has joined #xaric
*** 2 users on #xaric at 04:31PM
[ Triddle | @laeos ]
*** Channel #xaric was created at Sun Dec 17 16:30:48 2006
*** Xaric: Join to #xaric was synced in 0.043 secs!!
*** mode #xaric +o Triddle by laeos
*** SignOff laeos: #xaric (Client Quit)
*** laeos n=rfeany@cpe-76-172-221-31.socal.res.rr.com has joined #xaric
*** mode #xaric +o laeos by Triddle

[3] @Triddle [Lag 0] via irc.freenode.net #xaric (+ns)
>laeos< why do you waste your time on a 6 year old irc client when no one uses
      IRC anymore?
[laeos] i'm not really sure :)

[2] 04:40PM Triddle (+ei) [Lag 0] via irc.freenode.net [Query: laeos] AAAAAAAA
*** Odd server stuff: "ballard.freenode.net 1165644295" ()
*** Xaric: Join to #wikipedia-en was synced in 0.069 secs!!
Athaena> oh, I see, going by percentages as on
[[User:Gurch/Reports/ArbComElections]] and/or [[User:Mathbot/ArbCom
Election December 2006]]
ShakespeareFan00> Indeed
ShakespeareFan00> and I don't think it was useless
Athaena> nope
Athaena> it's of interest.
ShakespeareFan00> Of course the 'apointments' still have to be confirmed and
      accepted
*** tehbrandon n=tehbrandon@unaffiliated/tehbrandon has joined #wikipedia-en
[1] Triddle [Lag 0] via irc.freenode.net #wikipedia (+n)
0
```

# Coding your changes



# Coding your changes

---

- Plan
- Code
- Compile & run
- Test & debug

# Coding your changes

---

- Plan
  - Trace existing paths of execution
  - 
  - 
  -

# Coding your changes

---

- Plan

- Trace existing paths of execution
- Find examples similar to your goal
- 
-

# Coding your changes

---

- Plan

- Trace existing paths of execution
- Find examples similar to your goal
- Learn which lines are relevant
-



# Coding your changes

---

## ■ Plan

- Trace existing paths of execution
- Find examples similar to your goal
- Learn which lines are relevant
- Your friends are grep and the lxr ident search

# Coding your changes

---

- Hack your code
  - Language is C
  - Follow kernel coding style
  - Gain skill with your editor

# Coding your changes

---

- Compile and run
  - This involves installation and rebooting!
  - 
  -

# Coding your changes

---

- Compile and run
  - This involves installation and rebooting!
  - Use a virtual machine or dedicated machine
  -

# Coding your changes

---

- Compile and run
  - This involves installation and rebooting!
  - Use a virtual machine or dedicated machine
  - Maintain a known working and a test kernel

# Coding your changes

---

- Test and debug
  - Your friend is `printk()`
  - 
  -

# Coding your changes

---

- Test and debug
  - Your friend is `printk()`
  - Find messages in `/var/log/kern.log`
  -

# Coding your changes

---

- Test and debug
  - Your friend is `printk()`
  - Find messages in `/var/log/kern.log`
  - Create testing scenarios



# Generating and Delivering Your Patch



# Delivering Your Patch

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- Git commit strategy
- Git branching strategy
- Composing the commit message
- The patch

# Delivering Your Patch

---

- Git commit strategy
  - Make small incremental changes
  - 
  - 
  - 
  -

# Delivering Your Patch

---

- Git commit strategy
  - Make small incremental changes
  - Make changes in logical order
  - 
  - 
  -

# Delivering Your Patch

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- Git commit strategy
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  - Each change should be encapsulated
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  - Be prepared to alter previous commits
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# Delivering Your Patch

---

- Git commit strategy
  - Make small incremental changes
  - Make changes in logical order
  - Each change should be encapsulated
  - Be prepared to alter previous commits
  - Be prepared for upstream changes as you update your sources

# Delivering Your Patch

---

- Git branching strategy
  - Keep master branch unmodified

—

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# Delivering Your Patch

---

- Git branching strategy
  - Keep master branch unmodified
  - Create a working branch
  - 
  -

# Delivering Your Patch

---

- Git branching strategy
  - Keep master branch unmodified
  - Create a working branch
  - Use a throwaway branch to squash commits
  -

# Delivering Your Patch

---

- Git branching strategy
  - Keep master branch unmodified
  - Create a working branch
  - Use a throwaway branch to squash commits
  - If this method doesn't work for you, try another

# Delivering Your Patch

---

- Composing the commit message
  - Work as hard on this as you do on coding!

—

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—

# Delivering Your Patch

---

- Composing the commit message
  - Work as hard on this as you do on coding!
  - Read existing examples
  - 
  -

# Delivering Your Patch

---

- Composing the commit message
  - Work as hard on this as you do on coding!
  - Read existing examples
  - Be concise, yet thorough
  -

# Delivering Your Patch

---

- Composing the commit message
  - Work as hard on this as you do on coding!
  - Read existing examples
  - Be concise, yet thorough
  - Use imperative language

# Delivering Your Patch

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- The patch itself
  - Run checkpatch.pl on the files you change

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# Delivering Your Patch

---

- The patch itself
  - Run `checkpatch.pl` on the files you change
  - Generate patch with a git command
  - 
  -

# Delivering Your Patch

---

- The patch itself
  - Run `checkpatch.pl` on the files you change
  - Generate patch with a git command
  - Cc everyone involved with the code
  -

# Delivering Your Patch

---

- The patch itself
  - Run `checkpatch.pl` on the files you change
  - Generate patch with a git command
  - Cc everyone involved with the code
  - Send using plain text mail

# Delivering Your Patch

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- Why plain text?
  - Email formatting will break your code

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# Delivering Your Patch

---

- Why plain text?
  - Email formatting will break your code
  - Team members will apply your patch as is
  - 
  -

# Delivering Your Patch

---

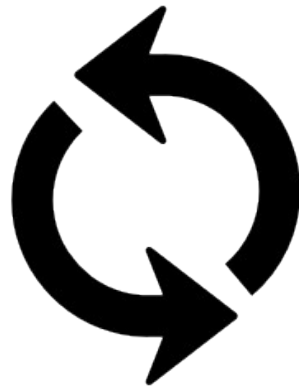
- Why plain text?
  - Email formatting will break your code
  - Team members will apply your patch as is
  - Commit message will become subject line and content
  -

# Delivering Your Patch

---

- Why plain text?
  - Email formatting will break your code
  - Team members will apply your patch as is
  - Commit message will become subject line and content
  - Use a specific mail client such as mutt (no gmail!)

Now wait for your feedback,  
And do it all again...





# Happy Hacking!



# Got Feedback?

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★ Rate and Review the session using the  
GHC Mobile App

To download visit [www.gracehopper.org](http://www.gracehopper.org)

# Resources

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- Gnome Outreach Program for Women <https://wiki.gnome.org/OutreachProgramForWomen>
- Kernel.org git repositories <https://git.kernel.org/cgit/>
- Linux Kernel Newbies <http://kernelnewbies.org/>
- OPW Intro page <http://kernelnewbies.org/OPWIntro>
- The Eudypsula Challenge <http://eudypsula-challenge.org/>
- KVM Installation <https://help.ubuntu.com/community/KVM/Installation>
- Linux Kernel Mailing List <https://lkml.org/>
- Various Linux related mailing lists at Gmane <http://gmmane.org/find.php?list=kernel>
- Linux Foundation events <http://events.linuxfoundation.org/>
- Linux Weekly News <http://lwn.net/>
- #irchelp <http://www.irchelp.org/>
- Irssi – The Client of the Future <http://www.irssi.org/>
- Wikipedia entry for the grep command <http://en.wikipedia.org/wiki/Grep>
- Linux Cross Reference at Free Electrons <http://lxr.free-electrons.com/>
- Linux Kernel Coding Style (pdf) [https://computing.llnl.gov/linux/slurm/coding\\_style.pdf](https://computing.llnl.gov/linux/slurm/coding_style.pdf)
- Vim the editor <http://www.vim.org/>
- Pro Git <http://git-scm.com/book> <https://www.gitbook.io/book/gitbookio/progit>
- The Mutt E-Mail Client <http://www.mutt.org/>

# Image Credits

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# Title Goes Here

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- The first point
  - Sub-points
    - Down one more
      - And again
        - Once more

# Title Goes Here

---

- The first point
  - Sub-points
    - Down one more
      - And again
        - Once more