A Look at Copperhead OS Security-focused Android

Jim Campbell

Penguicon!!!

April 30th, 2017





Introduction to Copperhead OS

What we'll talk about . . .



Introduction to Copperhead OS

What we'll talk about . . .

- Background
- Key Features
- Copperhead IRL
- Useful F-Droid applications



What is Copperhead OS?

Hardened Android ROM based on AOSP



- Hardened Android ROM based on AOSP
- Only for Nexus / Pixel devices



- Hardened Android ROM based on AOSP
- Only for Nexus / Pixel devices
- Supported for as long as Google offers support



- Hardened Android ROM based on AOSP
- Only for Nexus / Pixel devices
- Supported for as long as Google offers support
- 5x / 6p Get version upgrades until Sept of 2017
- 5x / 6p Security updates until Sept of 2018



- Hardened Android ROM based on AOSP
- Only for Nexus / Pixel devices
- Supported for as long as Google offers support
- 5x / 6p Get version upgrades until Sept of 2017
- 5x / 6p Security updates until Sept of 2018
- Pixel Get version upgrades until October of 2018
- Pixel Security updates until October of 2019



- Hardened Android ROM based on AOSP
- Only for Nexus / Pixel devices
- Supported for as long as Google offers support
- 5x / 6p Get version upgrades until Sept of 2017
- 5x / 6p Security updates until Sept of 2018
- Pixel Get version upgrades until October of 2018
- Pixel Security updates until October of 2019



Good For You

Background



Good For You

Copperhead OS is cool if:

You're a free software enthusiast



Good For You

- You're a free software enthusiast
- You don't want apps that eat personal data and privacy



Good For You

- You're a free software enthusiast
- You don't want apps that eat personal data and privacy
- You can live without Uber/Lyft and Spotify
- . . . or are willing to fuss (i.e., install microg)



Good For You

- You're a free software enthusiast
- You don't want apps that eat personal data and privacy
- You can live without Uber/Lyft and Spotify
- . . . or are willing to fuss (i.e., install microg)
- You like the supported phones



Good For You

- You're a free software enthusiast
- You don't want apps that eat personal data and privacy
- You can live without Uber/Lyft and Spotify
- . . . or are willing to fuss (i.e., install microg)
- You like the supported phones





Copperhead may not be the best if:

You want a Libre phone



- You want a Libre phone
- You want to use Spotify without fuss



Maybe For Someone Else

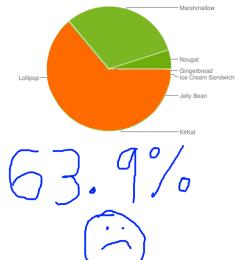
- You want a Libre phone
- You want to use Spotify without fuss
- You don't want to tinker or device is too pricey



- You want a Libre phone
- You want to use Spotify without fuss
- You don't want to tinker or device is too pricey



Android device support == * Sad Emoji *





Even among supported devices, security is less than ideal:

OEMs are slow to update (at best, 1x/month)



- OEMs are slow to update (at best, 1x/month)
- Encryption not always on by default



- OEMs are slow to update (at best, 1x/month)
- Encryption not always on by default
- Default applications don't provide E2E encryption



- OEMs are slow to update (at best, 1x/month)
- Encryption not always on by default
- Default applications don't provide E2E encryption
- AOSP doesn't always choose most secure defaults



- OEMs are slow to update (at best, 1x/month)
- Encryption not always on by default
- Default applications don't provide E2E encryption
- AOSP doesn't always choose most secure defaults



Beginnings of Copperhead Security

Lead developer of Copperhead OS is former maintainer of GR Security and PaX patches on Arch Linux.



Beginnings of Copperhead Security

Lead developer of Copperhead OS is former maintainer of GR Security and PaX patches on Arch Linux.

Saw a gap in the market for a firm to specialize in defensive security.



So, they started their company and OS





So, they started their company and OS they also started a blog:

Memory disclosure mitigations in CopperheadOS



- Memory disclosure mitigations in CopperheadOS
- Hardening Android's Bionic libc



Beginnings of Copperhead OS

- Memory disclosure mitigations in CopperheadOS
- Hardening Android's Bionic libc
- Separating Android's encryption and lockscreen passwords



Beginnings of Copperhead OS

- Memory disclosure mitigations in CopperheadOS
- Hardening Android's Bionic libc
- Separating Android's encryption and lockscreen passwords
- Integrating PaX into Android



Beginnings of Copperhead OS

- Memory disclosure mitigations in CopperheadOS
- Hardening Android's Bionic libc
- Separating Android's encryption and lockscreen passwords
- Integrating PaX into Android
- The State of ASLR on Android Lollipop



Beginnings of Copperhead OS

- Memory disclosure mitigations in CopperheadOS
- Hardening Android's Bionic libc
- Separating Android's encryption and lockscreen passwords
- Integrating PaX into Android
- The State of ASLR on Android Lollipop



They submit a lot upstream

- fread (upstreamed)
- fwrite (upstreamed)
- getcwd (submitted upstream)
- memchr (upstreamed)
- memrchr (upstreamed)
- pread (upstreamed)
- pread64 (upstreamed)
- pwrite
- pwrite64
- readlink (upstreamed)
- readlinkat (upstreamed)

Source: AOSP repository



As a custom ROM, they offer features you'd expect from an OEM OS:

Signed OS and signed updates



- Signed OS and signed updates
- Verified boot



- Signed OS and signed updates
- Verified boot
- Device can be OEM locked after install



- Signed OS and signed updates
- Verified boot
- Device can be OEM locked after install
- Does not require root



A Custom ROM like an OEM OS

- Signed OS and signed updates
- Verified boot
- Device can be OEM locked after install
- Does not require root
- Can leave "untrusted sources" disabled



A Custom ROM like an OEM OS

- Signed OS and signed updates
- Verified boot
- Device can be OEM locked after install
- Does not require root
- Can leave "untrusted sources" disabled



Solid Default Settings

Configured with privacy-respecting features from the get-go:



Solid Default Settings

Configured with privacy-respecting features from the get-go:

Encrypted by default



Configured with privacy-respecting features from the get-go:

- Encrypted by default
- Notifications hidden



Solid Default Settings

Configured with privacy-respecting features from the get-go:

- Encrypted by default
- Notifications hidden
- Longer max pasword length (16 char max upgraded to 64)



Solid Default Settings

Configured with privacy-respecting features from the get-go:

- Encrypted by default
- Notifications hidden
- Longer max pasword length (16 char max upgraded to 64)
- Others: Navigation error correction, contextual search, network prediction, metrics and hyperlink auditing are disabled by default.



Jim Campbell Penguicon!!!



Additional Features

And they include security-related features that others don't:

MAC address randomization (where supported)



Additional Features

- MAC address randomization (where supported)
- Can set different login and decrypt passwords



Additional Features

- MAC address randomization (where supported)
- Can set different login and decrypt passwords
- GR Security and PaX patches, but not all of them.
 3.10 kernel is old. Old drivers are an issue



Additional Features

- MAC address randomization (where supported)
- Can set different login and decrypt passwords
- GR Security and PaX patches, but not all of them.
 3.10 kernel is old. Old drivers are an issue
- Weekly updates, even if phone is encrypted



Additional Features

- MAC address randomization (where supported)
- Can set different login and decrypt passwords
- GR Security and PaX patches, but not all of them.
 3.10 kernel is old. Old drivers are an issue
- Weekly updates, even if phone is encrypted
- Can build from source



Additional Features

- MAC address randomization (where supported)
- Can set different login and decrypt passwords
- GR Security and PaX patches, but not all of them.
 3.10 kernel is old. Old drivers are an issue
- Weekly updates, even if phone is encrypted
- Can build from source
- Can build patch updates from source



Additional Features

- MAC address randomization (where supported)
- Can set different login and decrypt passwords
- GR Security and PaX patches, but not all of them.
 3.10 kernel is old. Old drivers are an issue
- Weekly updates, even if phone is encrypted
- Can build from source
- Can build patch updates from source



What's it like to use it?

• You can install it or you can buy it



- You can install it or you can buy it
- Installing? Make sure USB-C cable has data pins



- You can install it or you can buy it
- Installing? Make sure USB-C cable has data pins
- USB debugging "USB Configuration" to PTP (Picture Transfer Protocol)



- You can install it or you can buy it
- Installing? Make sure USB-C cable has data pins
- USB debugging "USB Configuration" to PTP (Picture Transfer Protocol)
- Project Fi and Sprint support are an issue (no data)



- You can install it or you can buy it
- Installing? Make sure USB-C cable has data pins
- USB debugging "USB Configuration" to PTP (Picture Transfer Protocol)
- Project Fi and Sprint support are an issue (no data)
 Sprint binary issue (not good) T-mobile APN issue (config update Sweet LTE!)



- You can install it or you can buy it
- Installing? Make sure USB-C cable has data pins
- USB debugging "USB Configuration" to PTP (Picture Transfer Protocol)
- Project Fi and Sprint support are an issue (no data)
 Sprint binary issue (not good) T-mobile APN issue (config update Sweet LTE!)
- Fingerprint scanner works



- You can install it or you can buy it
- Installing? Make sure USB-C cable has data pins
- USB debugging "USB Configuration" to PTP (Picture Transfer Protocol)
- Project Fi and Sprint support are an issue (no data)
 Sprint binary issue (not good) T-mobile APN issue (config update Sweet LTE!)
- Fingerprint scanner works
- No swype, must type. Good autocorrect and prediction



- You can install it or you can buy it
- Installing? Make sure USB-C cable has data pins
- USB debugging "USB Configuration" to PTP (Picture Transfer Protocol)
- Project Fi and Sprint support are an issue (no data)
 Sprint binary issue (not good) T-mobile APN issue (config update Sweet LTE!)
- Fingerprint scanner works
- No swype, must type. Good autocorrect and prediction
- No Lyft == Jim cold and wet in January rain, but I lived



- You can install it or you can buy it
- Installing? Make sure USB-C cable has data pins
- USB debugging "USB Configuration" to PTP (Picture Transfer Protocol)
- Project Fi and Sprint support are an issue (no data)
 Sprint binary issue (not good) T-mobile APN issue (config update Sweet LTE!)
- Fingerprint scanner works
- No swype, must type. Good autocorrect and prediction
- No Lyft == Jim cold and wet in January rain, but I lived



Sandboxed social media applications



Some cool uses

- Sandboxed social media applications
- Download youtube videos while on wifi, playback later!



Some cool uses

- Sandboxed social media applications
- Download youtube videos while on wifi, playback later!
- Defaults to DuckDuckGo for web search



Some cool uses

- Sandboxed social media applications
- Download youtube videos while on wifi, playback later!
- Defaults to DuckDuckGo for web search
- Can sync with NextCloud or Sandstorm.io Radicale



Some cool uses

- Sandboxed social media applications
- Download youtube videos while on wifi, playback later!
- Defaults to DuckDuckGo for web search
- Can sync with NextCloud or Sandstorm.io Radicale
- Loyalty cards without location tracking. Nice!



Some cool uses

- Sandboxed social media applications
- Download youtube videos while on wifi, playback later!
- Defaults to DuckDuckGo for web search
- Can sync with NextCloud or Sandstorm.io Radicale
- Loyalty cards without location tracking. Nice!
- Roughly weekly, super-simple updates



What's the application situation?

FDroid is at least as good as the Microsoft Store



What's the application situation?

FDroid is at least as good as the Microsoft Store

• Easy to find applications that use Material Design



What's the application situation?

- Easy to find applications that use Material Design
- Look for ones updated recently



What's the application situation?

- Easy to find applications that use Material Design
- Look for ones updated recently
- Browse web 64-bit Chromium



ackground Standout Features IRL **Applications** Discussion

What's the application situation?

- Easy to find applications that use Material Design
- Look for ones updated recently
- Browse web 64-bit Chromium
- Secure SMS Silence or Noise (. . . a Signal fork)



ackground Standout Features IRL **Applications** Discussion

What's the application situation?

- Easy to find applications that use Material Design
- Look for ones updated recently
- Browse web 64-bit Chromium
- Secure SMS Silence or Noise (. . . a Signal fork)
- Twitter Twidere or SlimSocial



ackground Standout Features IRL **Applications** Discussion

What's the application situation?

- Easy to find applications that use Material Design
- Look for ones updated recently
- Browse web 64-bit Chromium
- Secure SMS Silence or Noise (. . . a Signal fork)
- Twitter Twidere or SlimSocial
- Youtube NewPipe (stream or download videos locally)



What's the application situation?

- Easy to find applications that use Material Design
- Look for ones updated recently
- Browse web 64-bit Chromium
- Secure SMS Silence or Noise (. . . a Signal fork)
- Twitter Twidere or SlimSocial
- Youtube NewPipe (stream or download videos locally)
- Email K-9 Material



What's the application situation?

- Easy to find applications that use Material Design
- Look for ones updated recently
- Browse web 64-bit Chromium
- Secure SMS Silence or Noise (. . . a Signal fork)
- Twitter Twidere or SlimSocial
- Youtube NewPipe (stream or download videos locally)
- Email K-9 Material
- Calendar / Contacts Davdroid + Etar / Default Contacts app



A few other applications

What else is useful?

Maps with turn-by-turn directions - OSM Droid



A few other applications

- Maps with turn-by-turn directions OSM Droid
- RSS / News Newsblur



A few other applications

- Maps with turn-by-turn directions OSM Droid
- RSS / News Newsblur
- Podcasts AntennaPod



A few other applications

- Maps with turn-by-turn directions OSM Droid
- RSS / News Newsblur
- Podcasts AntennaPod
- Video VLC



A few other applications

- Maps with turn-by-turn directions OSM Droid
- RSS / News Newsblur
- Podcasts AntennaPod
- Video VLC
- Image Gallery Gallery



A few other applications

- Maps with turn-by-turn directions OSM Droid
- RSS / News Newsblur
- Podcasts AntennaPod
- Video VLC
- Image Gallery Gallery
- Creatively-named applications like Authenticator and Tasks



A few other applications

- Maps with turn-by-turn directions OSM Droid
- RSS / News Newsblur
- Podcasts AntennaPod
- Video VLC
- Image Gallery Gallery
- Creatively-named applications like Authenticator and Tasks
- Use loyalty cards w/o location tracking! Loyalty Locker



A few other applications

What else is useful?

- Maps with turn-by-turn directions OSM Droid
- RSS / News Newsblur
- Podcasts AntennaPod
- Video VLC
- Image Gallery Gallery
- Creatively-named applications like Authenticator and Tasks
- Use loyalty cards w/o location tracking! Loyalty Locker
- Can set Chromium web apps on home screen



Jim Campbell Penguicon!!!

A few other applications

What else is useful?

- Maps with turn-by-turn directions OSM Droid
- RSS / News Newsblur
- Podcasts AntennaPod
- Video VLC
- Image Gallery Gallery
- Creatively-named applications like Authenticator and Tasks
- Use loyalty cards w/o location tracking! Loyalty Locker
- Can set Chromium web apps on home screen



Jim Campbell Penguicon!!!

These are useful, too!!

• Connect to Matrix network - Riot (So good!)



- Connect to Matrix network Riot (So good!)
- Games 1010! Konni (self-paced Tetris!)



- Connect to Matrix network Riot (So good!)
- Games 1010! Konni (self-paced Tetris!)
- Passwords Twik



- Connect to Matrix network Riot (So good!)
- Games 1010! Konni (self-paced Tetris!)
- Passwords Twik
- Github Forkhub



Even MORE applications

- Connect to Matrix network Riot (So good!)
- Games 1010! Konni (self-paced Tetris!)
- Passwords Twik
- Github Forkhub
- Facebook MaterialFBook



Even MORE applications

- Connect to Matrix network Riot (So good!)
- Games 1010! Konni (self-paced Tetris!)
- Passwords Twik
- Github Forkhub
- Facebook MaterialFBook
- Notes OmniNotes



Even MORE applications

- Connect to Matrix network Riot (So good!)
- Games 1010! Konni (self-paced Tetris!)
- Passwords Twik
- Github Forkhub
- Facebook MaterialFBook
- Notes OmniNotes
- Weight Tracking openScale



Even MORE applications

- Connect to Matrix network Riot (So good!)
- Games 1010! Konni (self-paced Tetris!)
- Passwords Twik
- Github Forkhub
- Facebook MaterialFBook
- Notes OmniNotes
- Weight Tracking openScale
- Two-Factor Authentication OTP Autheticator



Even MORE applications

- Connect to Matrix network Riot (So good!)
- Games 1010! Konni (self-paced Tetris!)
- Passwords Twik
- Github Forkhub
- Facebook MaterialFBook
- Notes OmniNotes
- Weight Tracking openScale
- Two-Factor Authentication OTP Autheticator





Let's talk:

• How does this stack up with IOS security?



Discussion

- How does this stack up with IOS security?
- Will I feel like a nerd for not having Uber on my phone?



- How does this stack up with IOS security?
- Will I feel like a nerd for not having Uber on my phone?
- Am I stuck in a privacy-bro world? What good does this do?



- How does this stack up with IOS security?
- Will I feel like a nerd for not having Uber on my phone?
- Am I stuck in a privacy-bro world? What good does this do?
- Would you use this?



- How does this stack up with IOS security?
- Will I feel like a nerd for not having Uber on my phone?
- Am I stuck in a privacy-bro world? What good does this do?
- Would you use this? Encourage someone else to use it?



- How does this stack up with IOS security?
- Will I feel like a nerd for not having Uber on my phone?
- Am I stuck in a privacy-bro world? What good does this do?
- Would you use this? Encourage someone else to use it?
- Other considerations?



- How does this stack up with IOS security?
- Will I feel like a nerd for not having Uber on my phone?
- Am I stuck in a privacy-bro world? What good does this do?
- Would you use this? Encourage someone else to use it?
- Other considerations?



Thank you! - jcampbell - ate - gnome - dote - org -

