

# Some challenges for the plumbing community

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We're doing great

Linux is everywhere

The code is advancing quickly

Our community is healthy



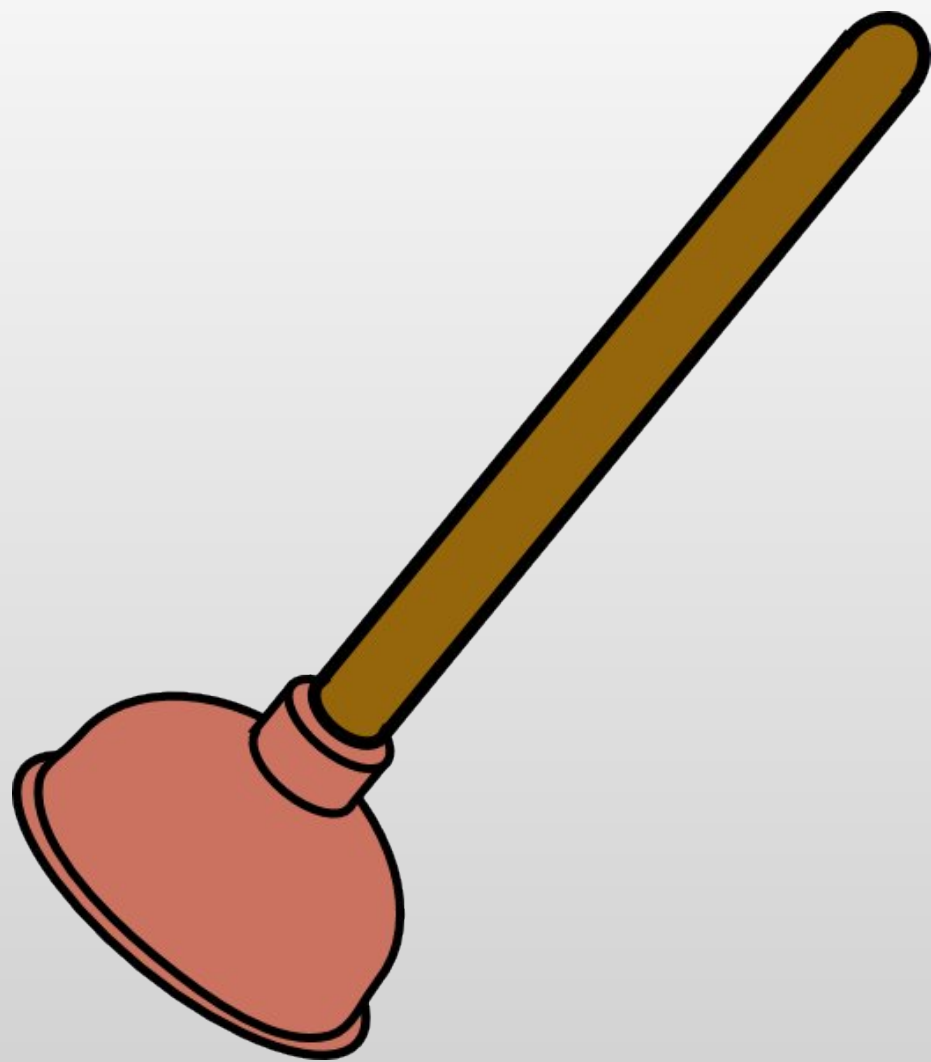
# Boring



# If we have problems...

...they are high quality problems





# Security



# Stuxnet



# Stuxnet

# RSA





Stuxnet

RSA

DigiNotar



Stuxnet

DigiNotar

RSA

kernel.org



Stuxnet



DigiNotar

RSA

kernel.org



# The bad guys are out there

They are:  
motivated  
capable  
well funded



It's not script kiddies anymore



photo: b34r.girl

# It's not just about money anymore

lives are at stake.



# We're on the front line



# We are plumbers!

Our pipes cannot leak.





# Is your code secure?

Who reviews it?

What sort of testing do you do?

What are your plans for dealing with vulnerabilities?



# Is your infrastructure secure?

Who has access to the systems?

Who can change files?

Are security updates being applied?

What is your plan in case of a breach?



# Are your processes secure?

Who can commit code?

What do they know about that code's provenance?

Who can sign releases?

Can you detect tampering?



# Be careful out there



# Tools

Plumbers need good tools!



Computers can be really good at  
finding bugs



Lockdep  
Valgrind  
Fault injection  
Sparse  
Smatch  
...



Lockdep  
Valgrind  
Fault injection  
Sparse  
Smatch  
...

But we could use more!





# Tools

Plumbers need good tools!

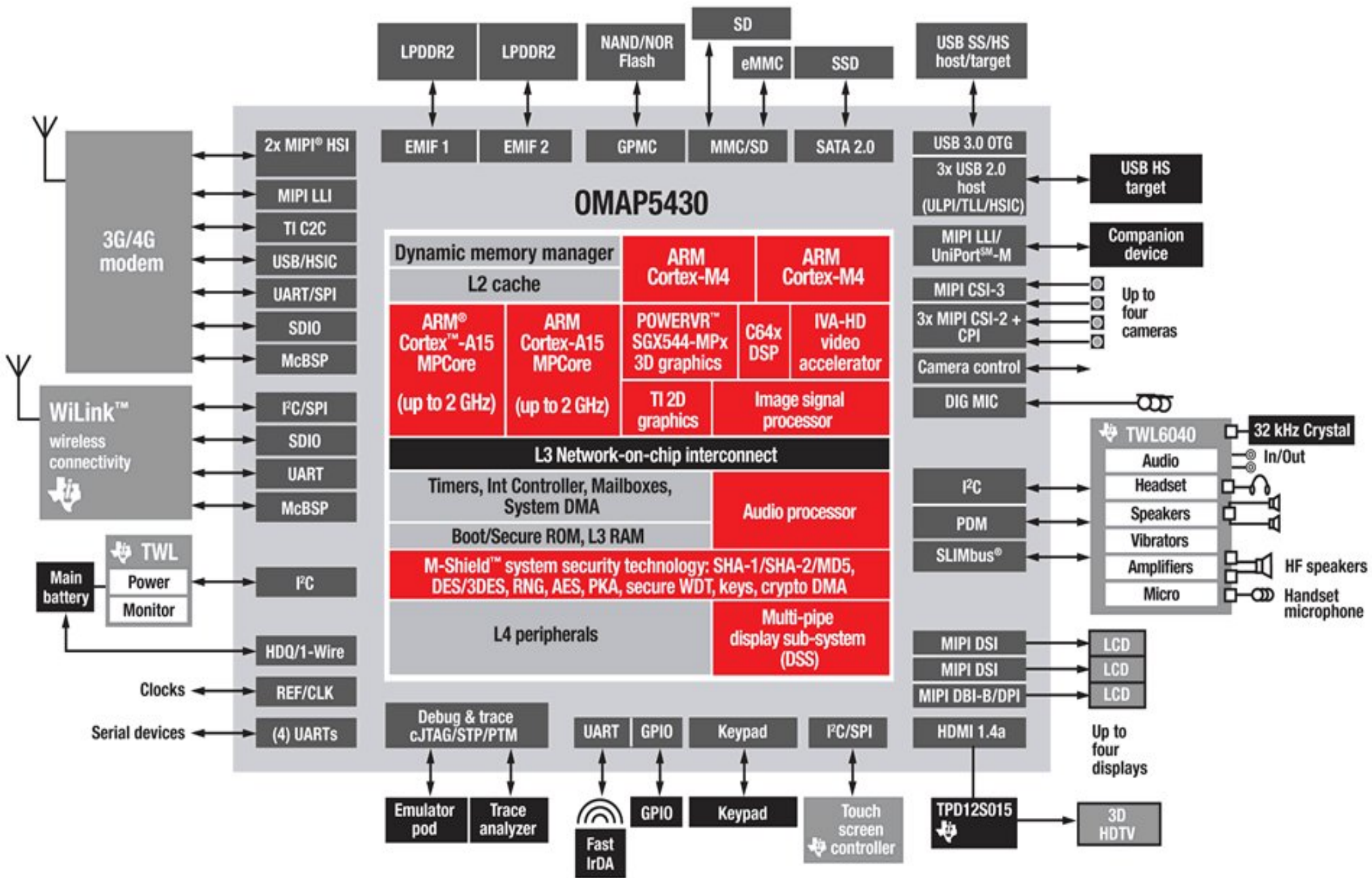
...and they need to actually use them



# Hardware



# TI OMAP5430 SoC



# Hardware complexity

...leads to software complexity

Asymmetric multiprocessing!

Thus:

- Memory management concerns

- Exposing independent processors to user space

- Complex power management



# Complex interfaces

Example: V4L2 media controller interface



# Control over our hardware

Life is relatively good  
but it could get better (or worse)



# Influence over hardware

Are the manufacturers listening to us?





Aaron Seigo



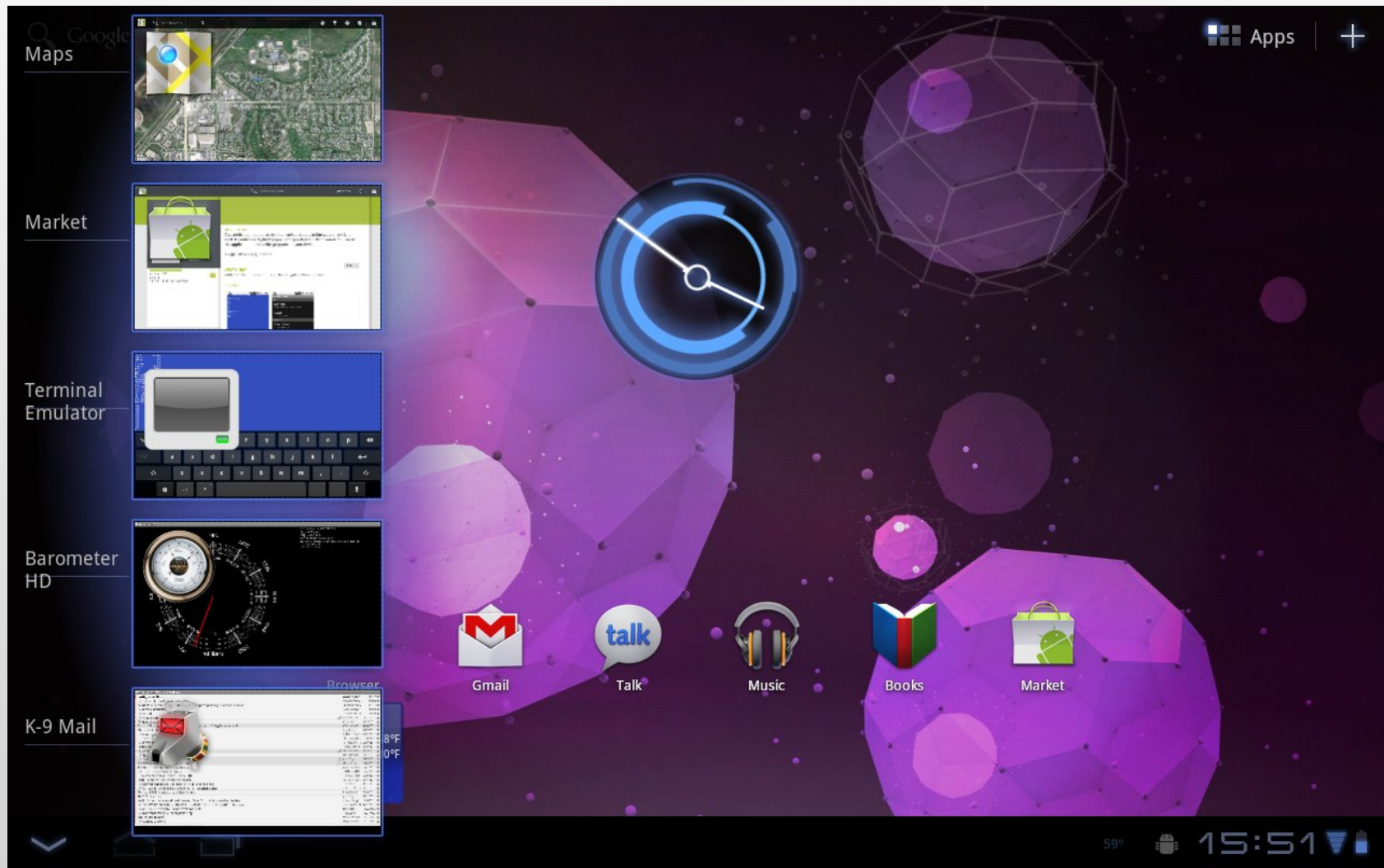
Bastien Nocera















Linux-based devices are great

Hackable Linux-based devices are even better

But...



How can we be more involved in the conception and design of those devices in the first place?



# Linux only





# Linux only

All the world is a...  
VAX



# Linux only

All the world is a...

~~VAX~~

SunOS box



# Linux only

All the world is a...

~~VAX~~

~~SunOS box~~

Eight-bit pseudocolor frame buffer



# Linux only

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~~SunOS box~~

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32-bit little-endian CPU



# Linux only

All the world is a...

~~VAX~~

~~SunOS box~~

~~Eight-bit pseudocolor frame buffer~~

~~32-bit little-endian CPU~~

~~POSIX-compatible OS~~

...

Linux box?



# Once upon a time

We depended heavily on portability



# Three years ago

The DRM tree deemphasized BSD support

This hurt BSD, but...



# Three years ago

The DRM tree deemphasized BSD support

This hurt BSD, but...

...would we rather do without kernel mode setting?



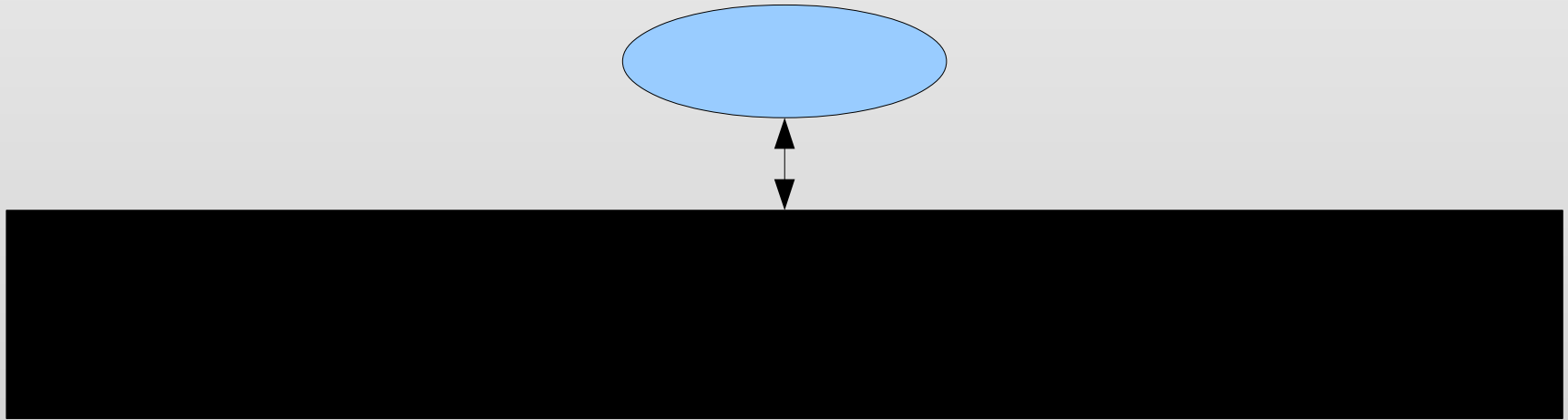


# Linux-only may be inevitable

...but let's try not to forget our roots



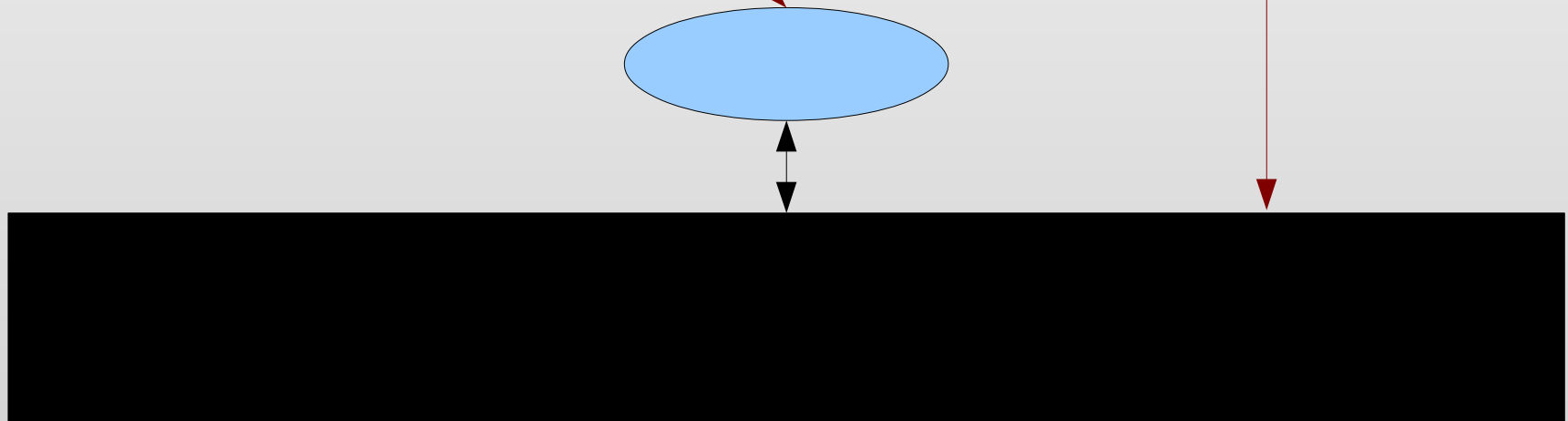
# The platform problem



# The platform problem

Code you control

Black-box  
platform



# Examples

The kernel's ARM subtree

XFree86

Opportunistic suspend

Asynchronous I/O

...



# The costs

Duplicated code

Inefficient solutions

Bugs



# The cost: lost opportunities

With a wider view we get:

- More comprehensive solutions to problems

- Better abstractions

- More eyes on the code

- More well-rounded developers



# Examples

mac80211



# Examples

PowerTop





# Examples

Bufferbloat

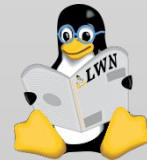
Unified memory management

GPU API

Holistic power management

Control groups

...



“Kernel cgroups only go so far. To provide the user-visible semantics that we want, we are forced to implement a large amount of control code in user space.”



# In summary

We have built a free operating  
system



# In summary

There are no immutable  
platforms



LPC is an ideal setting  
in which to address the  
platform problem



# Let's do it!

(Questions?)

