

Native Execution of iOS Apps on Android

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The Goal



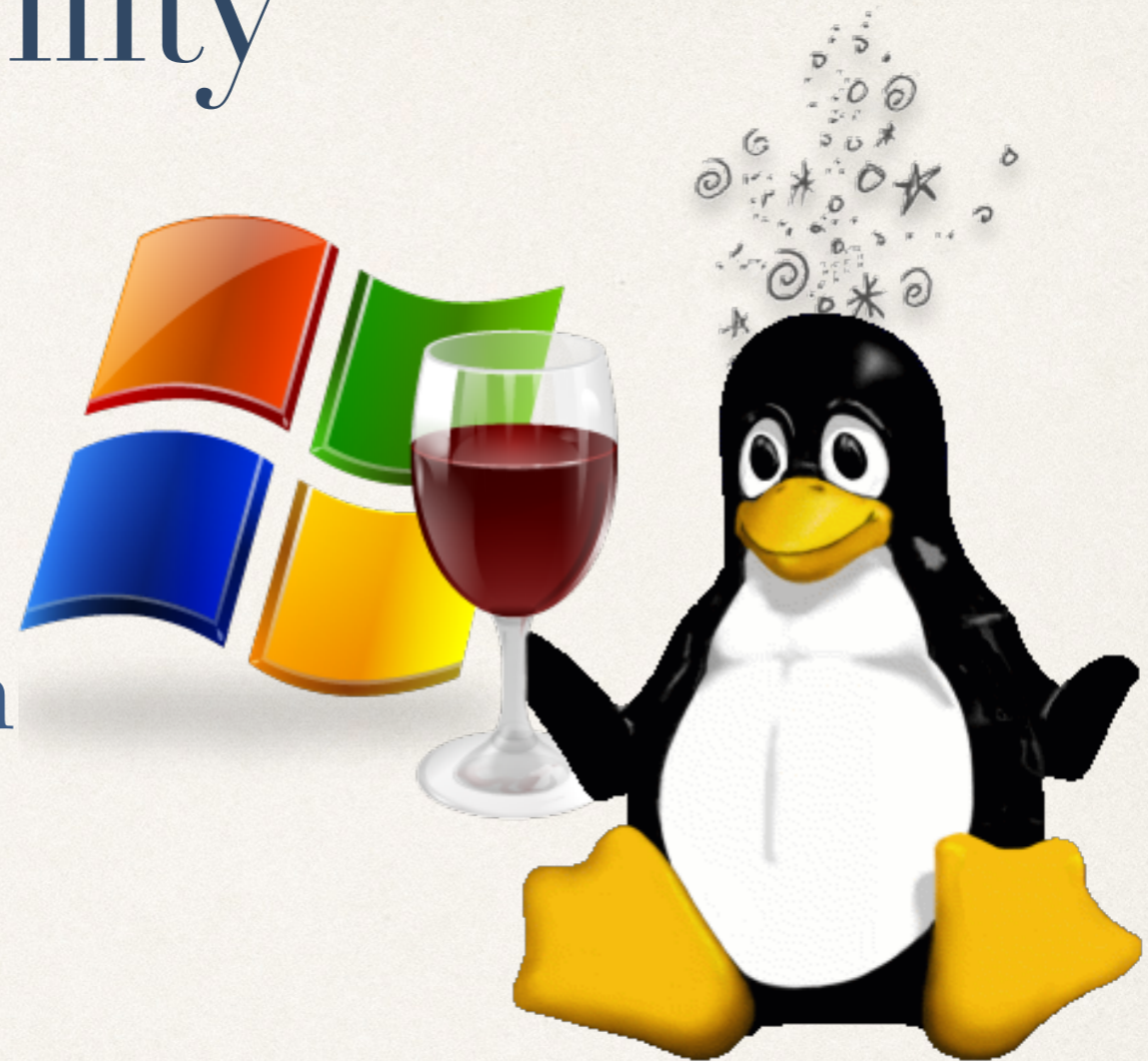
Virtualization



Binary Compatibility

WINE

API Reimplementation



- ❖ **immense implementation**
- ❖ **20 years later: still incomplete**

Binary Compatibility



Kernel ABI Compatibility

BSD LINUX COMPATIBILITY

- ❖ **missing kernel subsystem**
- ❖ **opaque driver interfaces**

Cider : OS Compatibility

- ❖ Direct execution of unmodified iOS apps
- ❖ Reuse existing libraries
- ❖ Reuse existing open source kernel code
- ❖ iOS apps can use Android libraries

Cider : OS Compatibility

- ❖ Personas
 - distinguish iOS and Linux threads
- ❖ Duct Tape
 - XNU code in the Linux kernel
- ❖ Diplomats
 - iOS apps use Android libraries

Cider : OS Compatibility



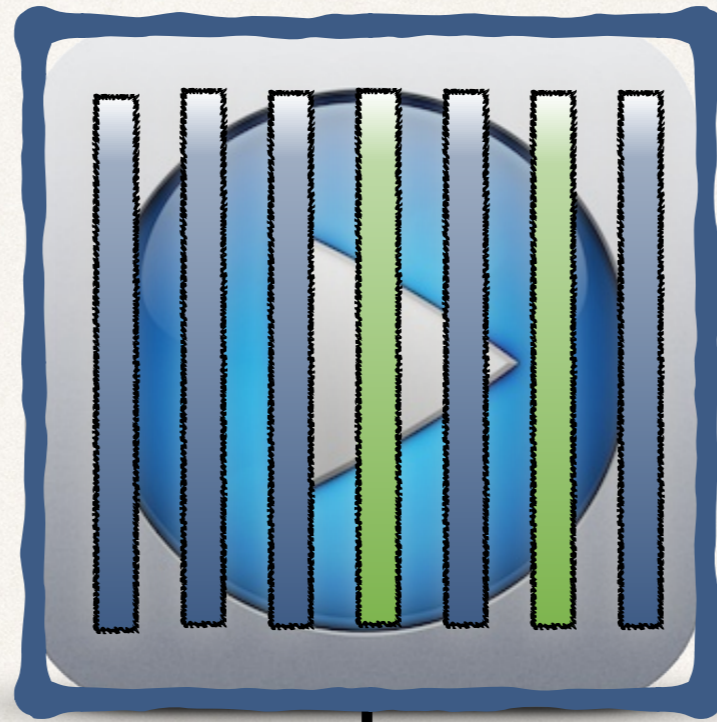
XNU syscall
Interface

Linux syscall
Interface

Cider Linux Kernel

Mach-O
Loader

Per-Thread Personas



XNU syscall
Interface

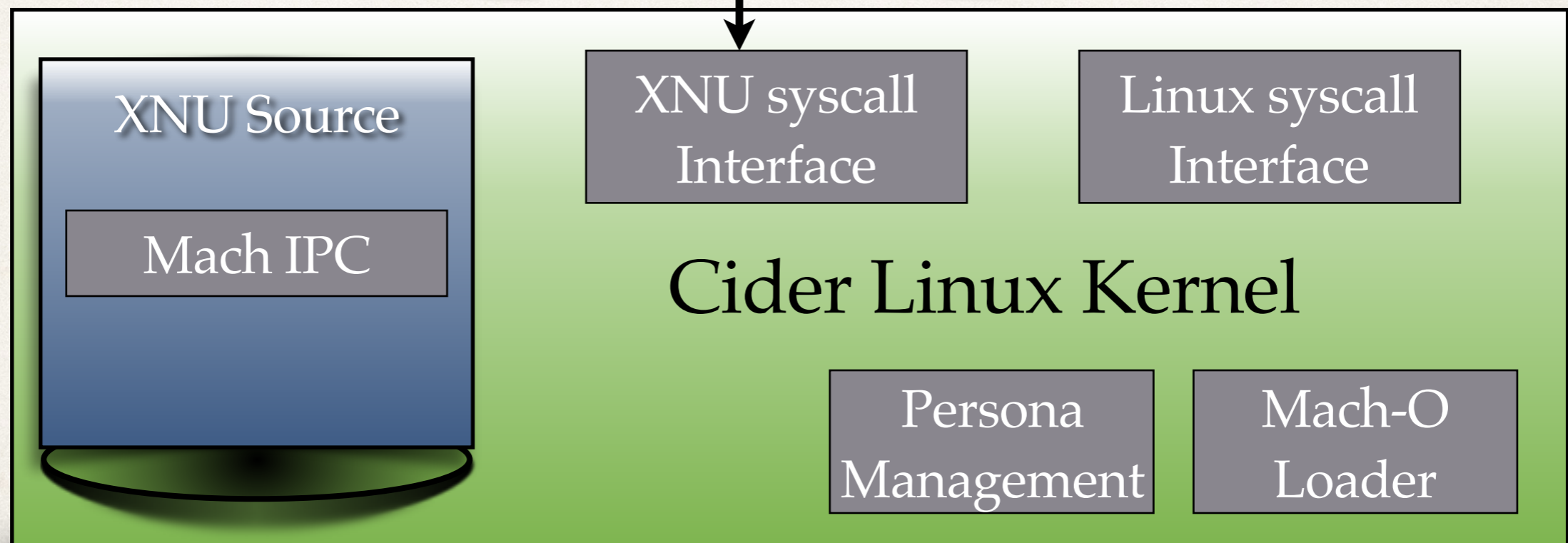
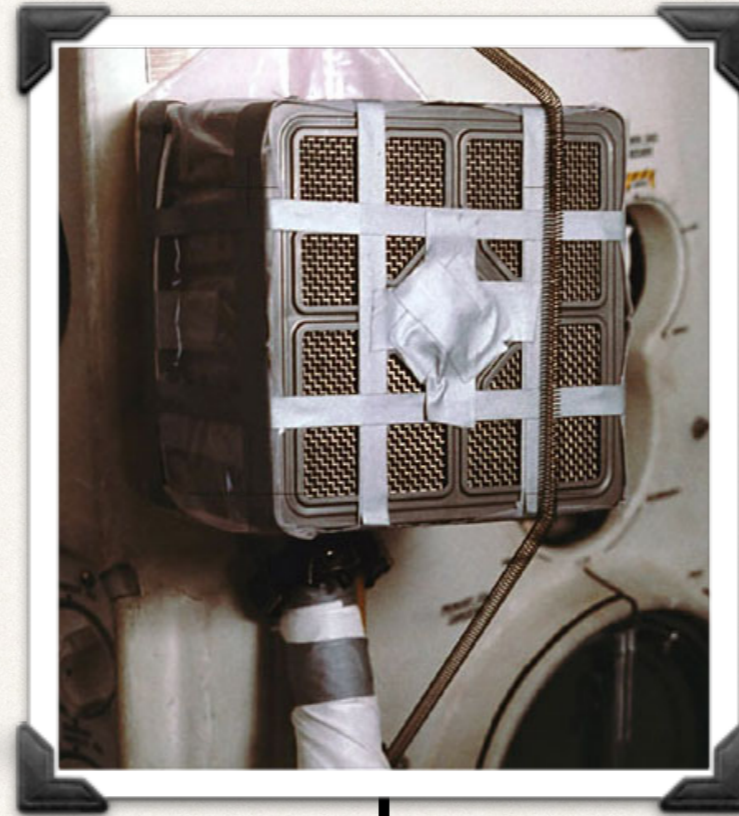
Linux syscall
Interface

Cider Linux Kernel

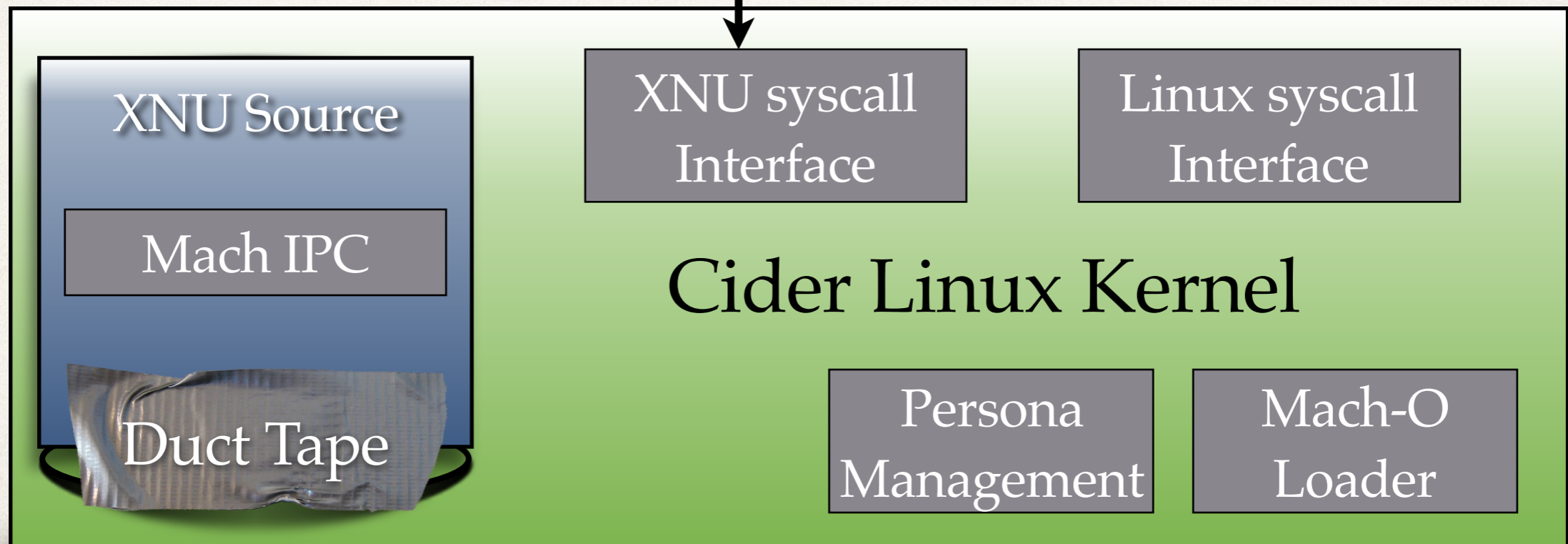
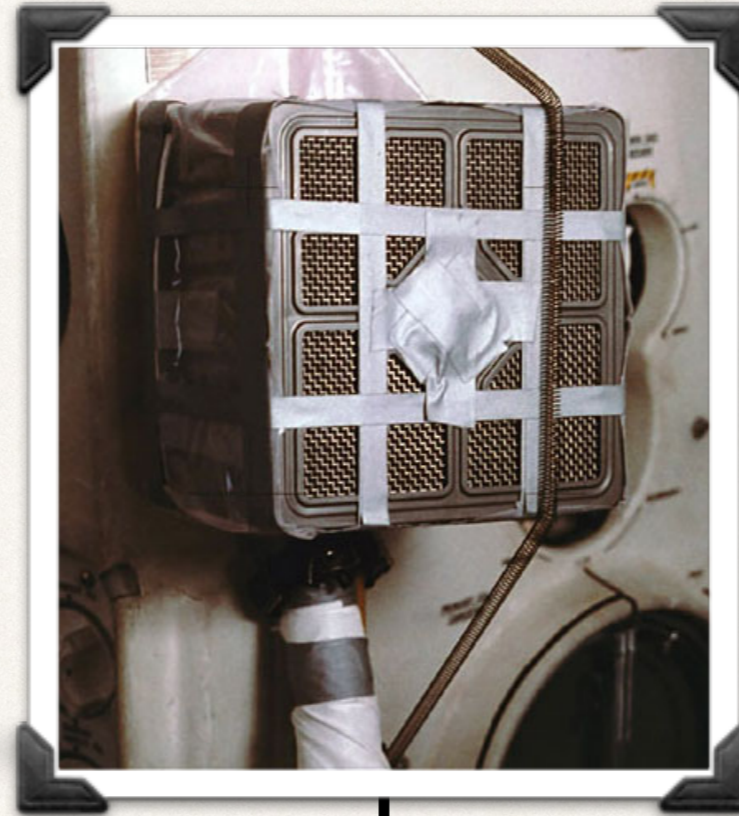
Persona
Management

Mach-O
Loader

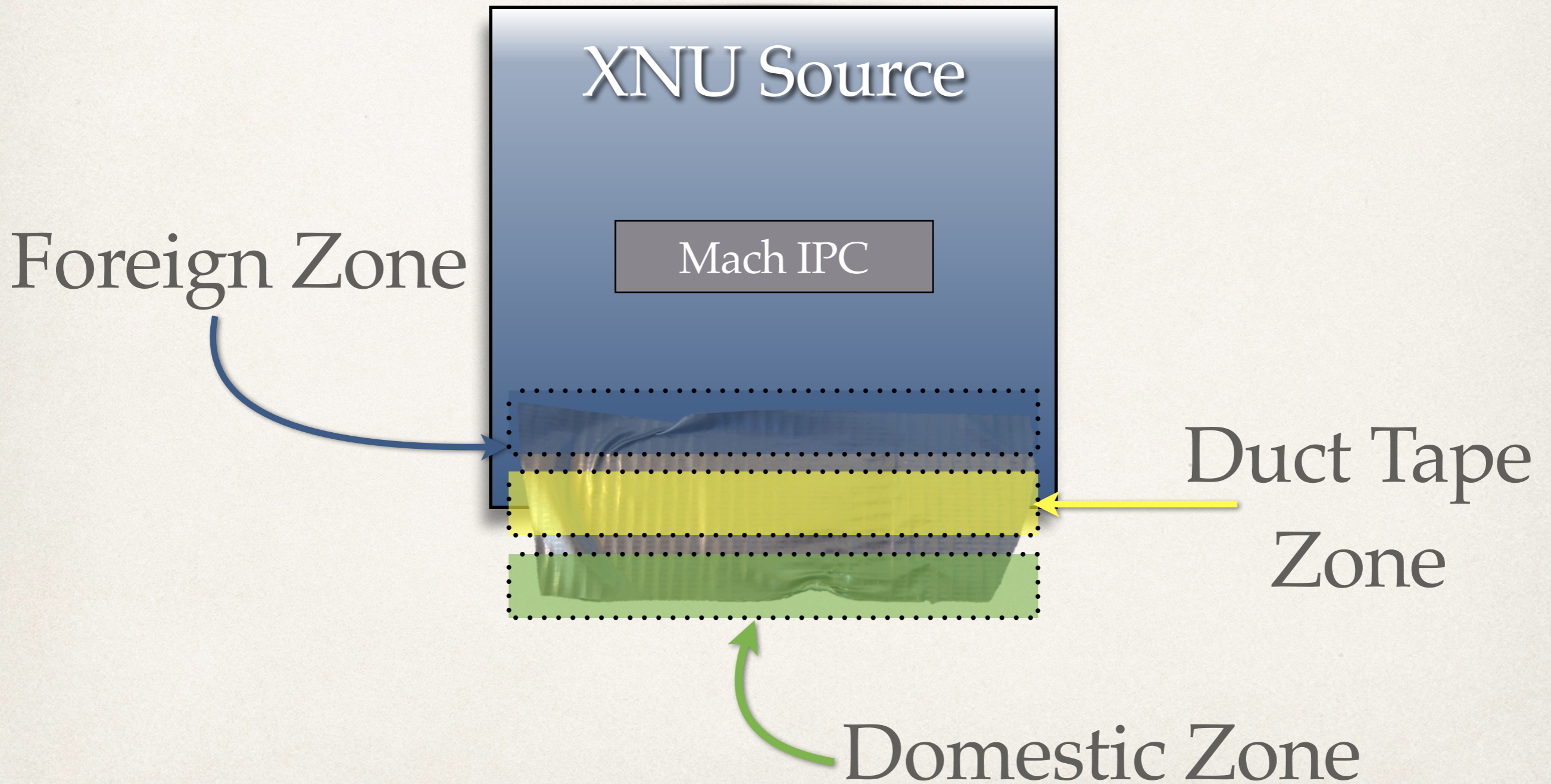
Cider : OS Compatibility



Duct tape

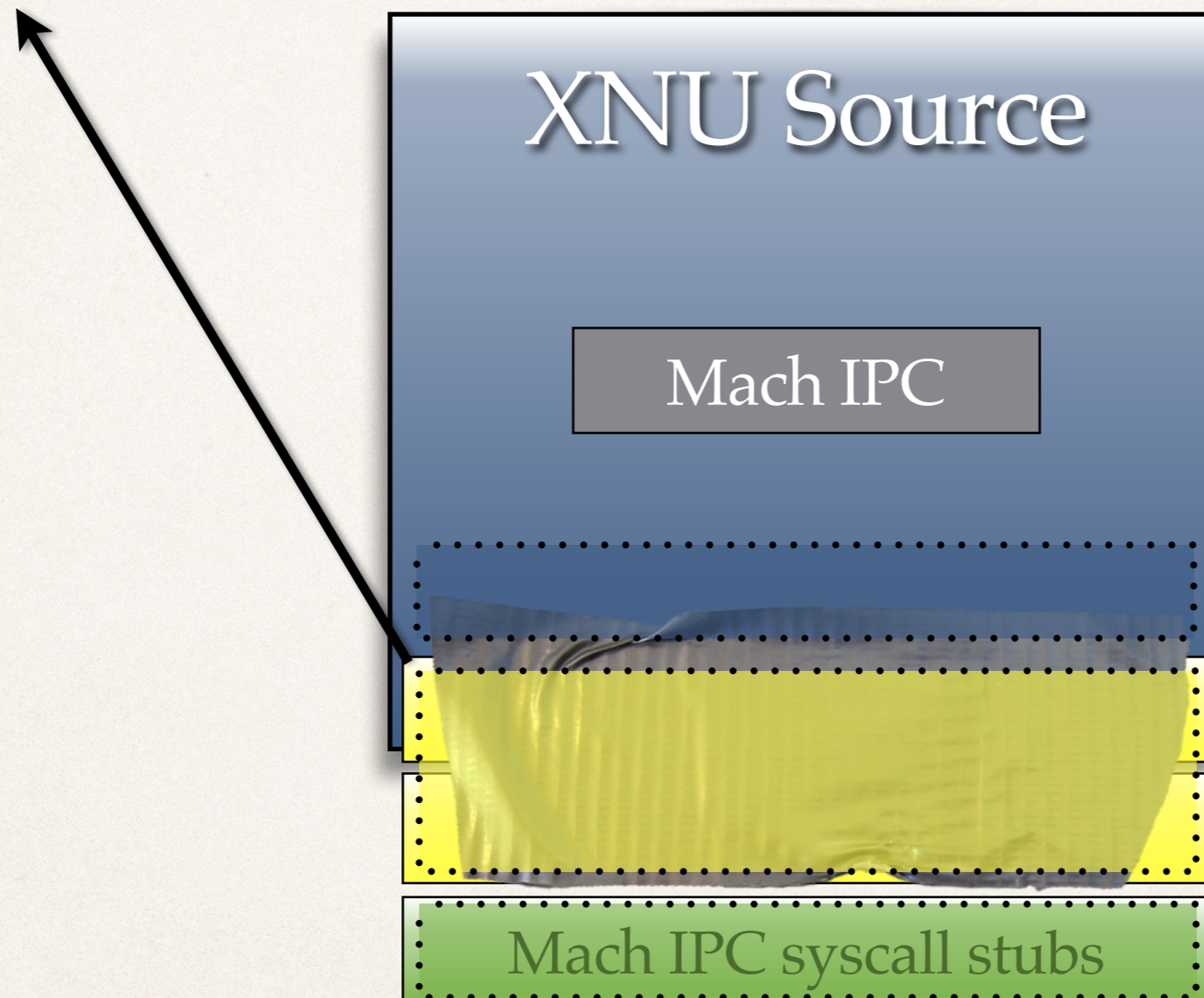


Duct tape



Duct tape

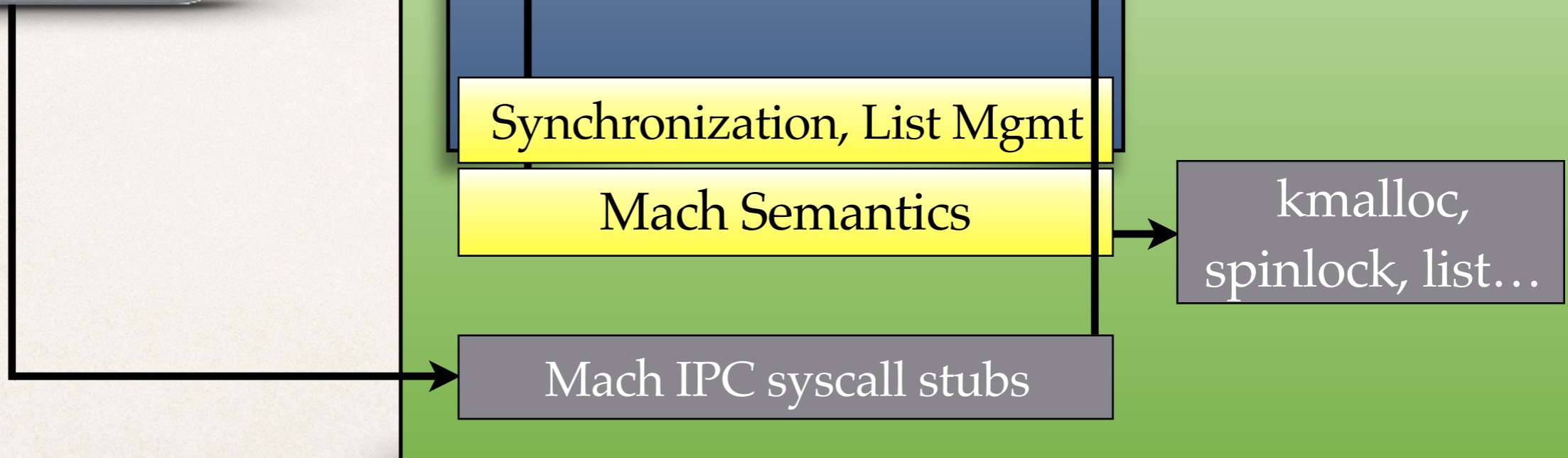
`lck_mtx_lock()` → `mutex_lock()`
`lck_mtx_t` → `struct mutex`



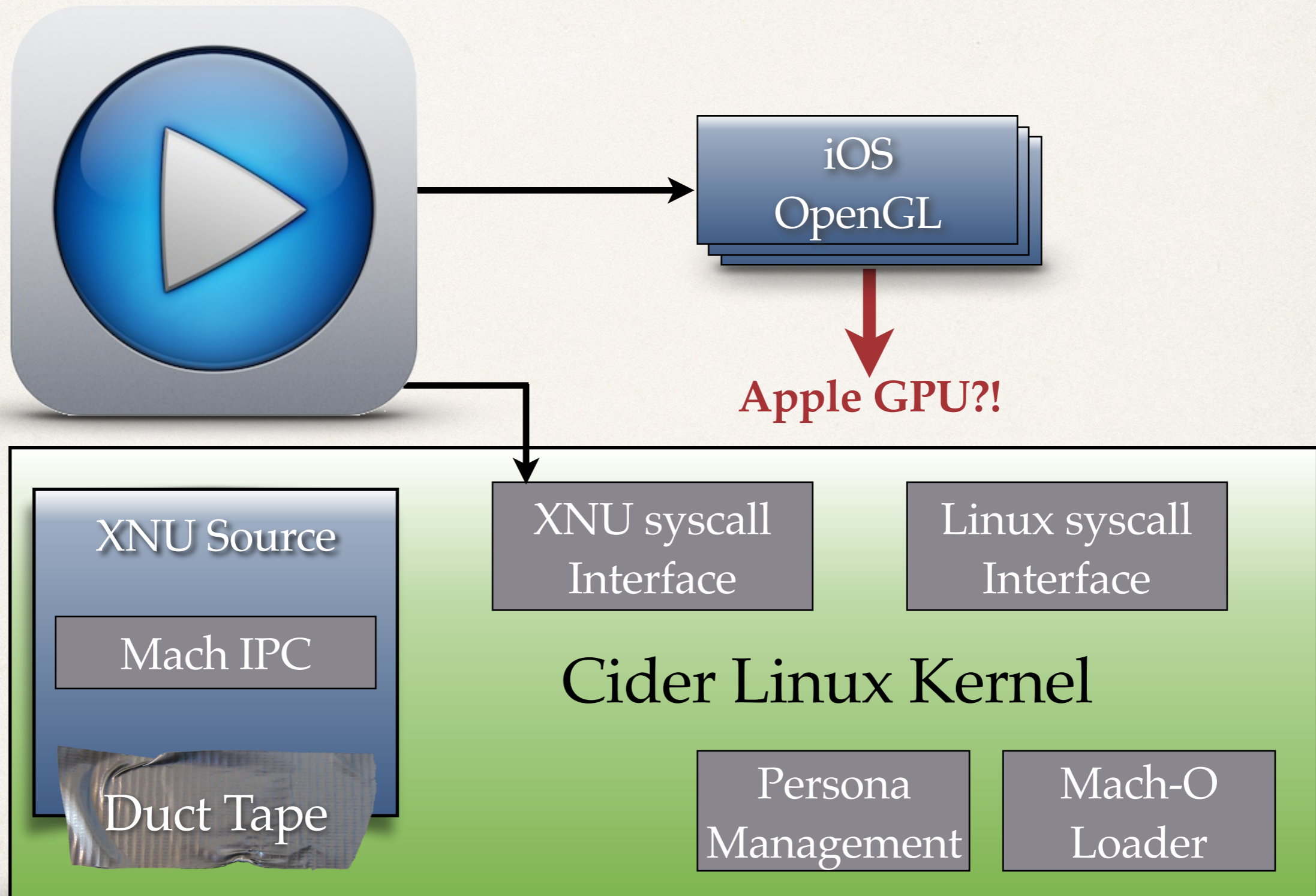
Linux kernel
 memory, synch,
 list management, etc.

kmalloc,
 spinlock, list...

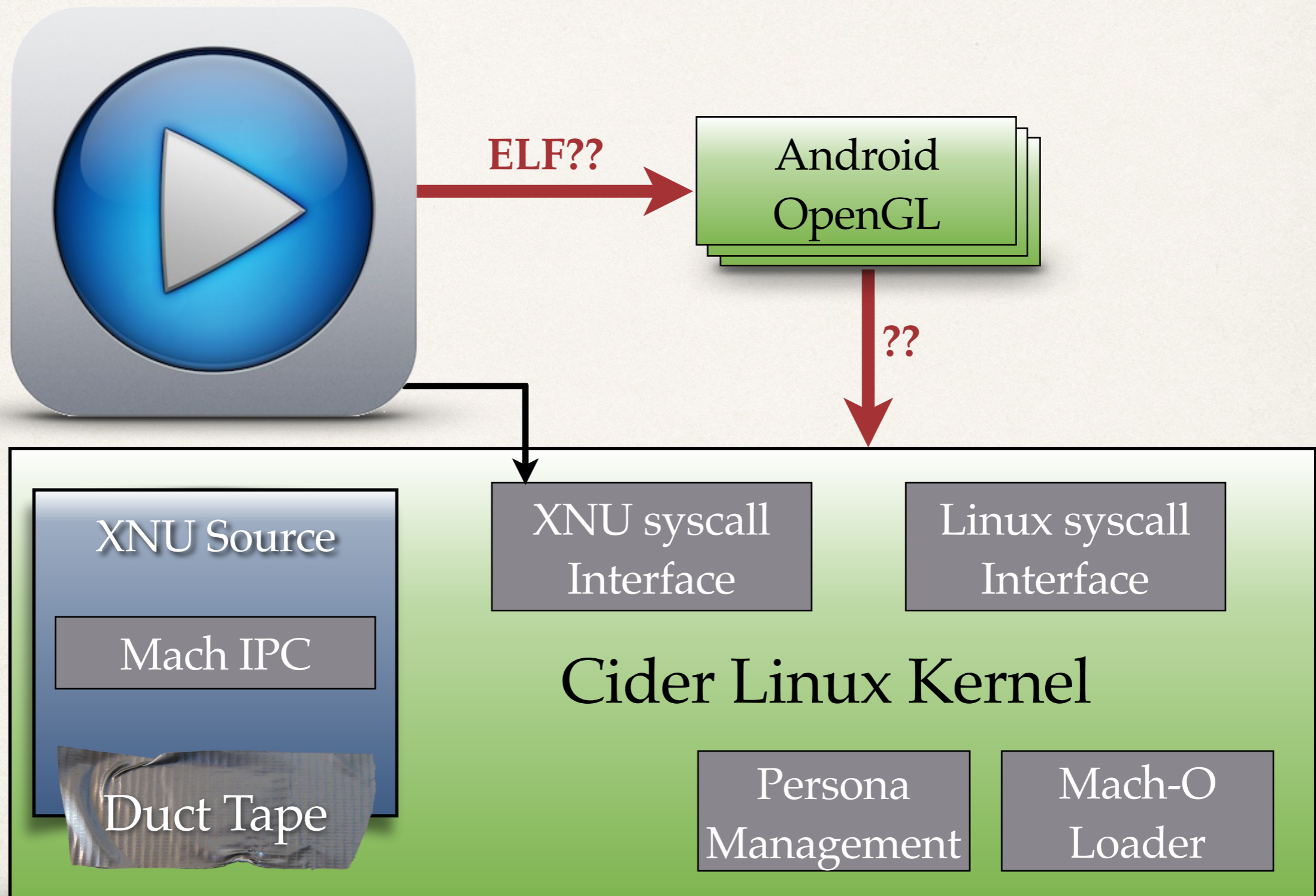
Duct tape



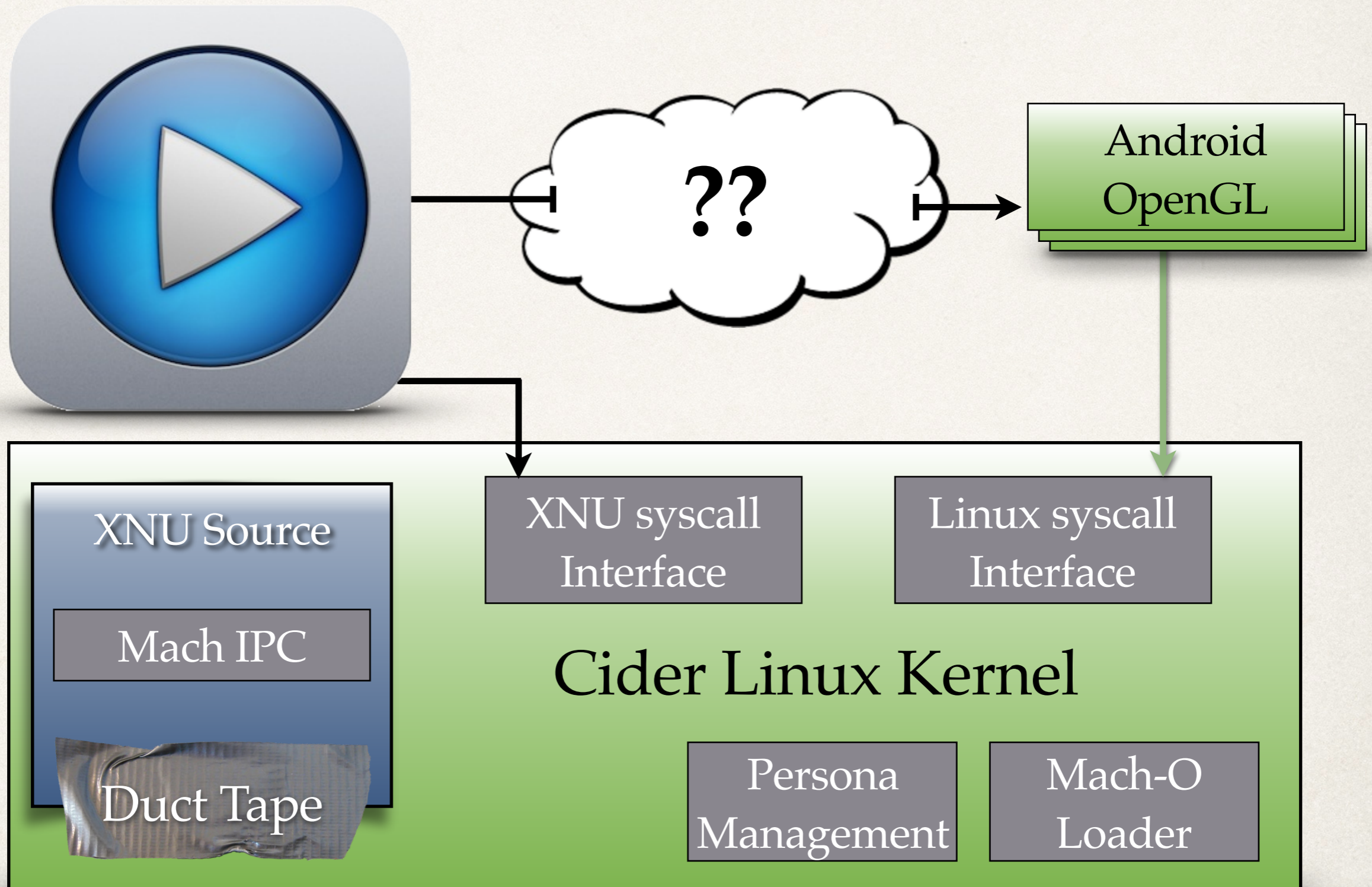
Cider : OS Compatibility



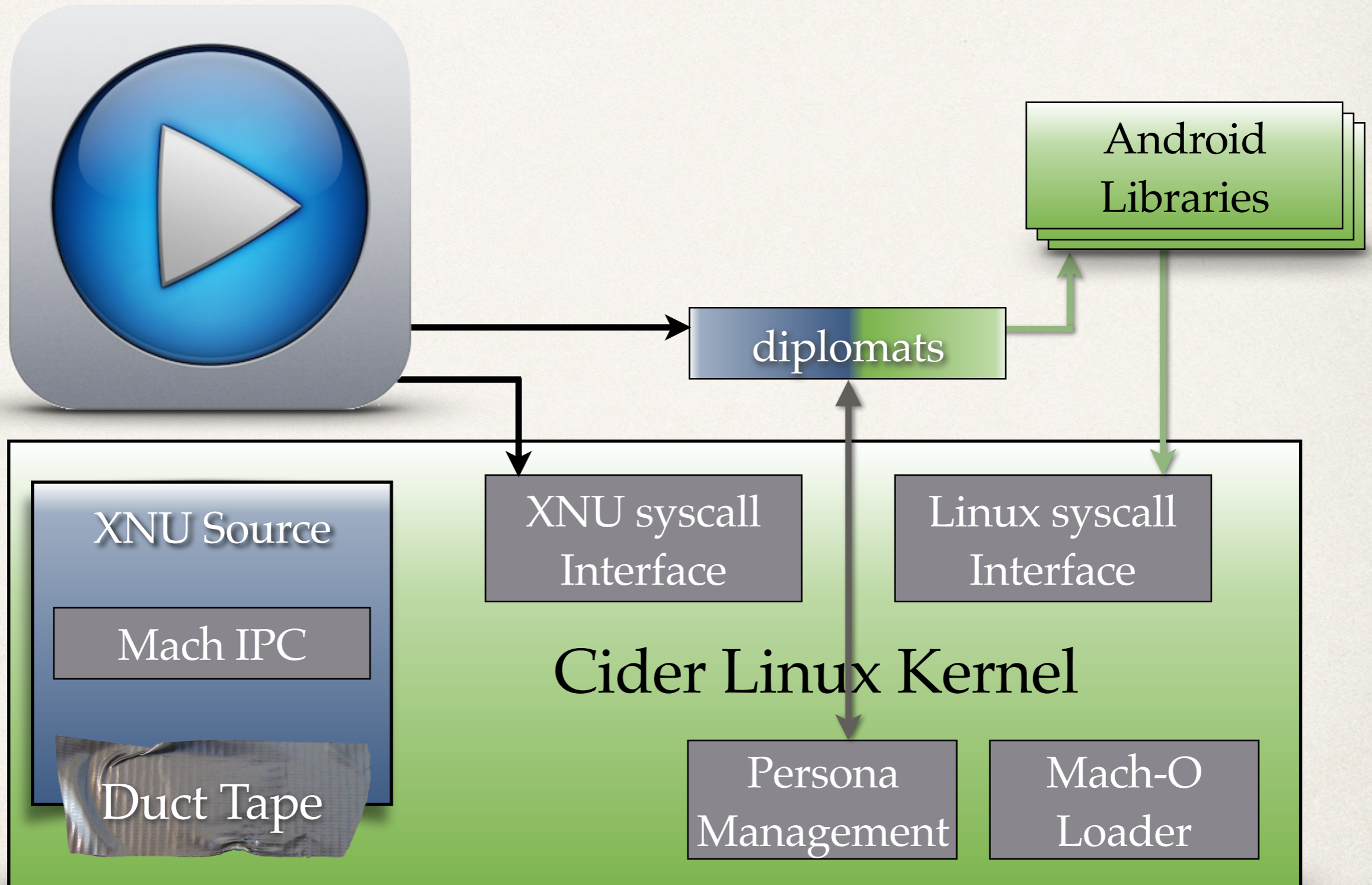
Cider : OS Compatibility



Cider : OS Compatibility

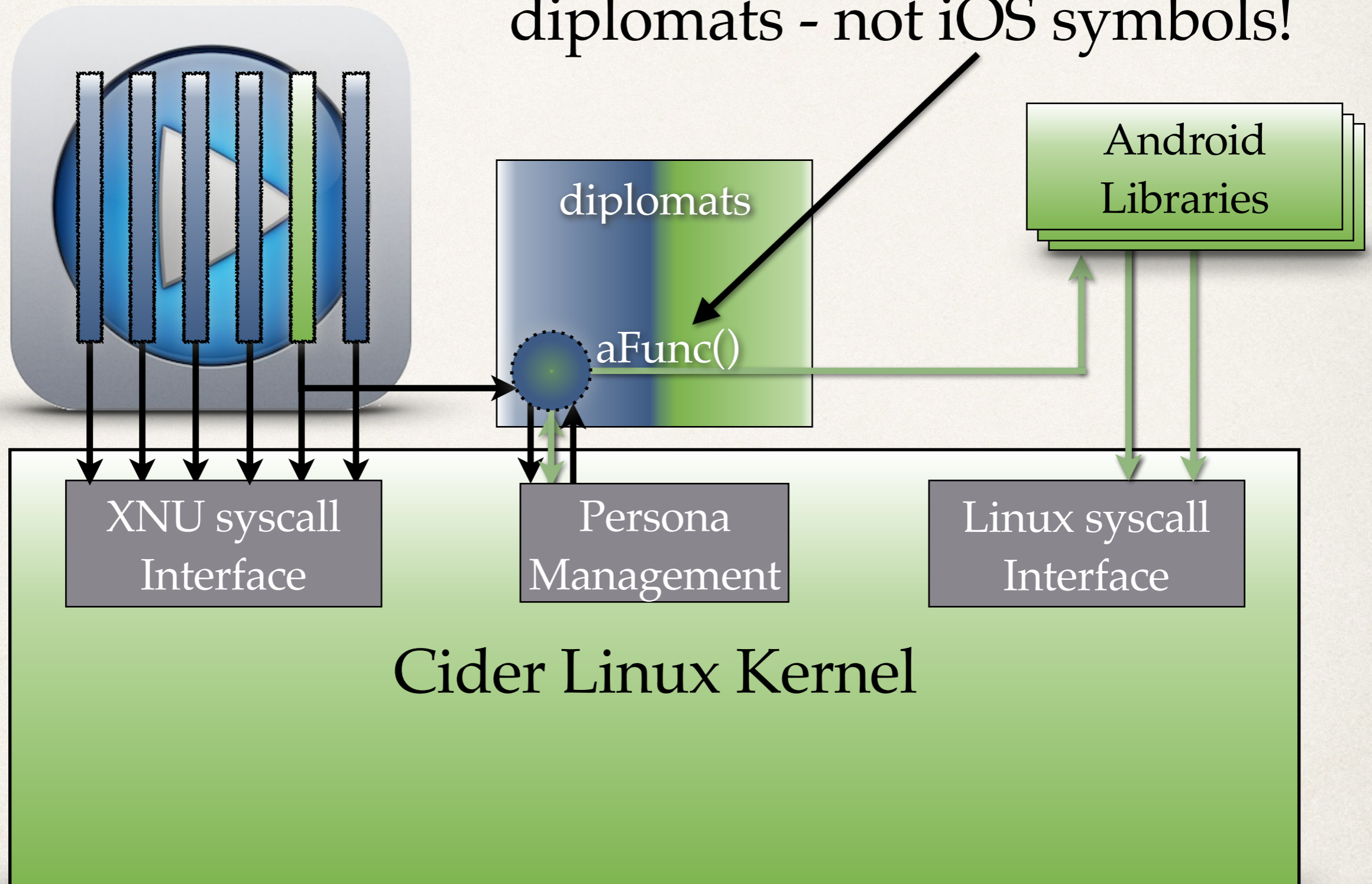


Diplomats

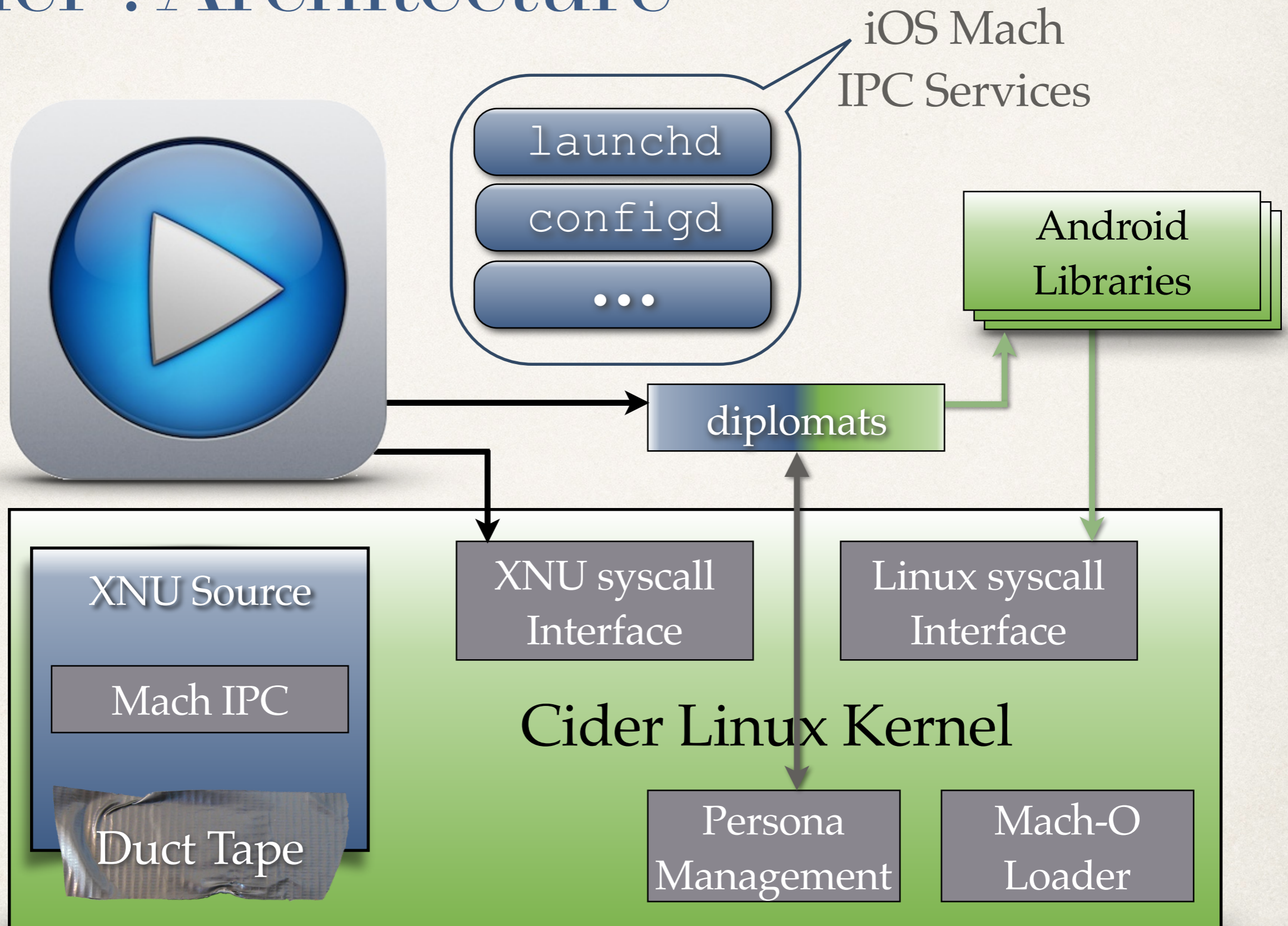


Diplomats

iOS App links against
diplomats - not iOS symbols!



Cider : Architecture



Cider: Prototype

iOS Apps!

❖ Nexus 7 (Tegra)

→ Integrated iOS app launch

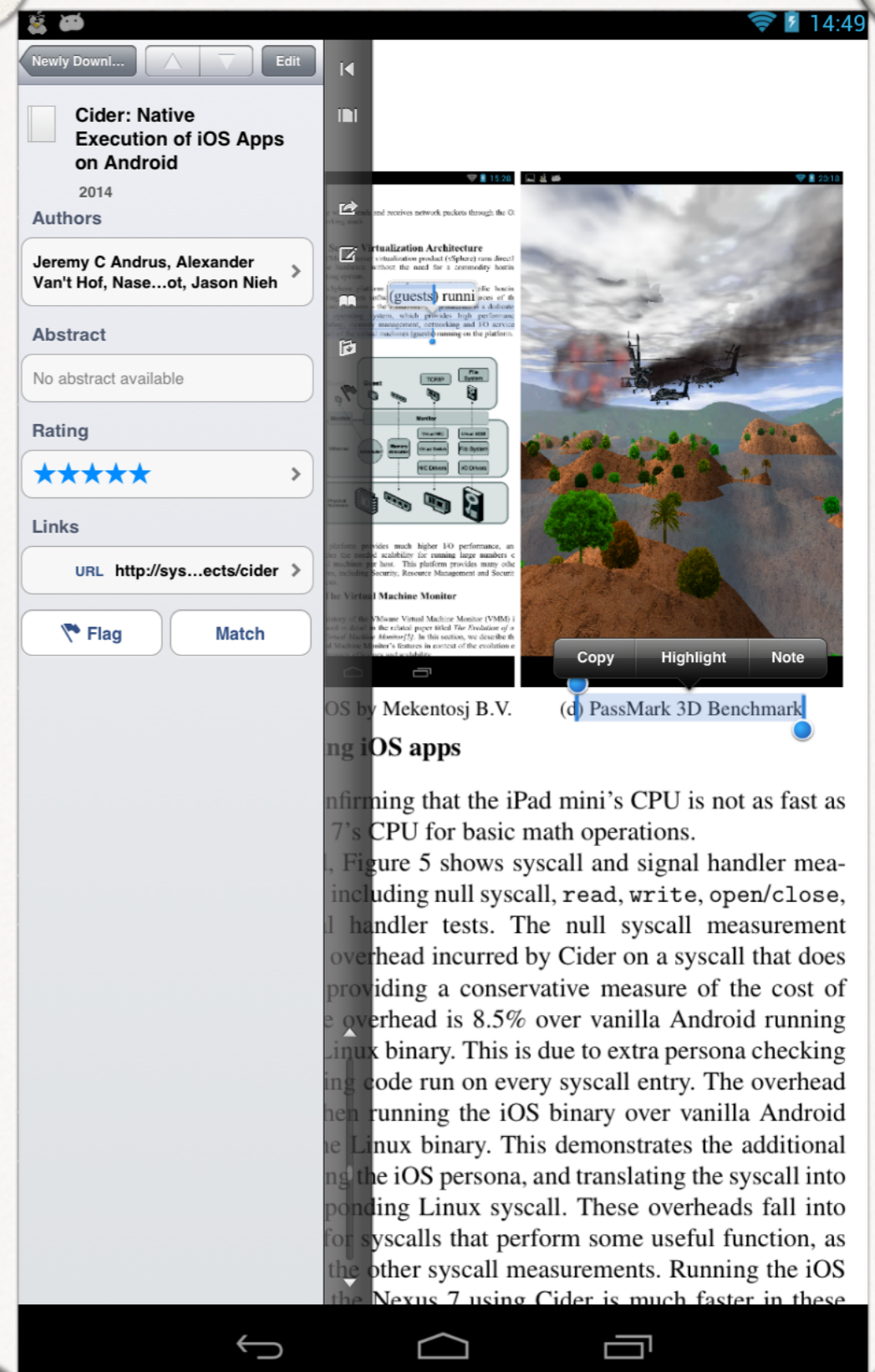
Android Apps!



Cider: Prototype

❖ Nexus 7 (Tegra)

- ➔ Full multi-touch support
- ➔ OpenGL for 2D / 3D graphics

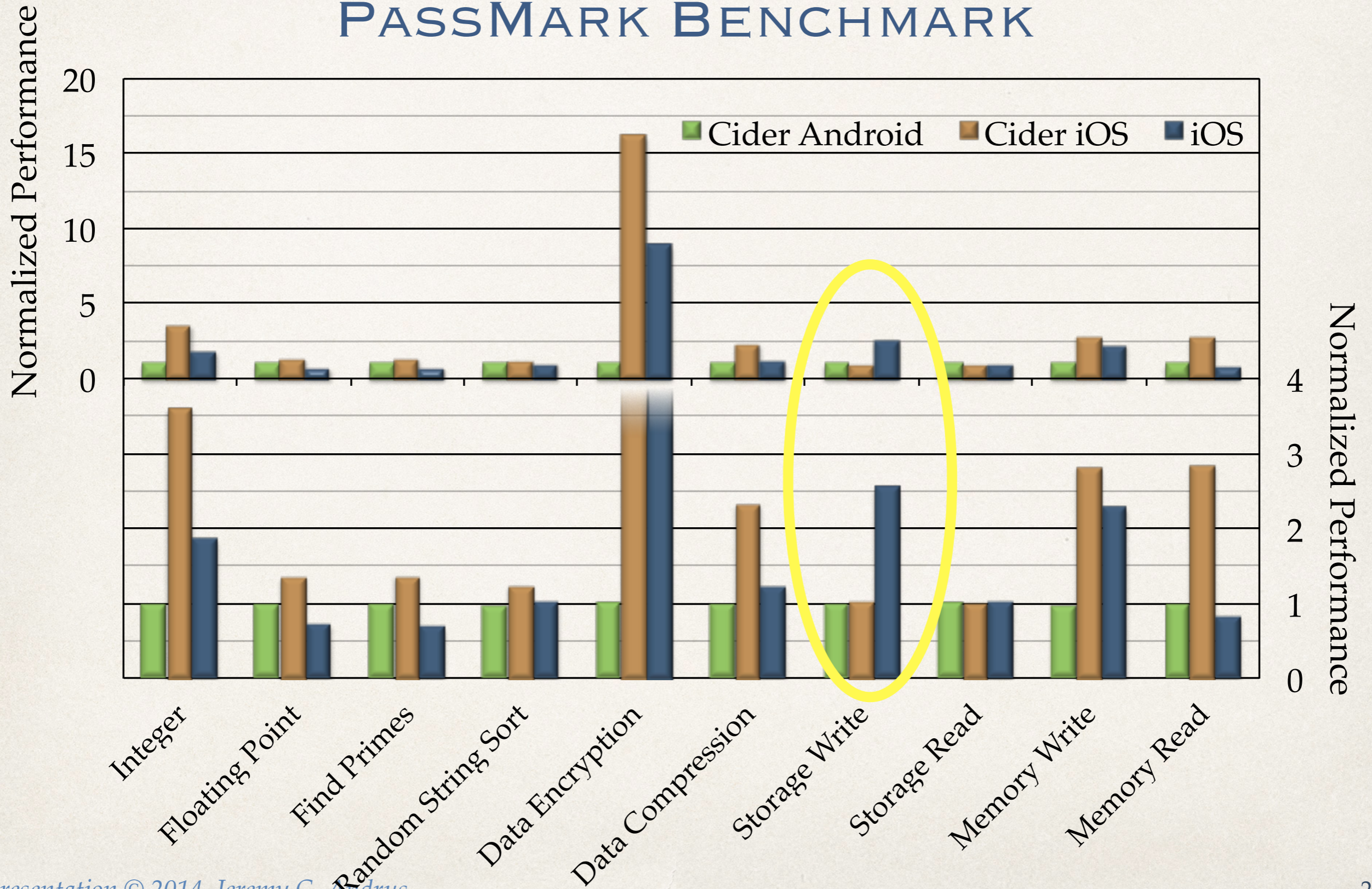


Cider: Experimental Results

- ❖ PassMark benchmark application
- ❖ Android App
 - ➔ Stock Nexus 7
 - ➔ Cider
- ❖ iOS App
 - ➔ Cider
 - ➔ iPad mini

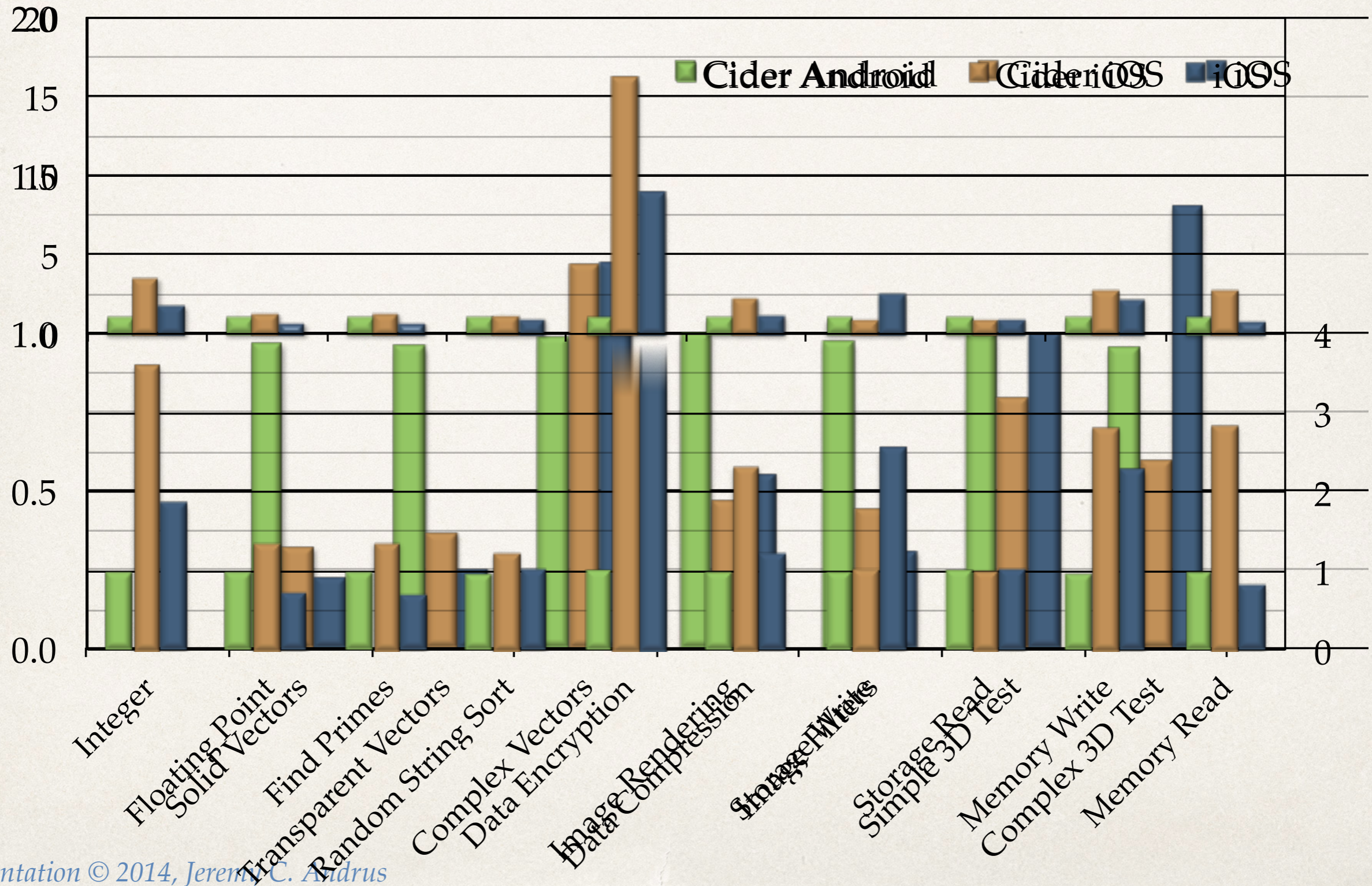
Cider: Experimental Results

PASSMARK BENCHMARK



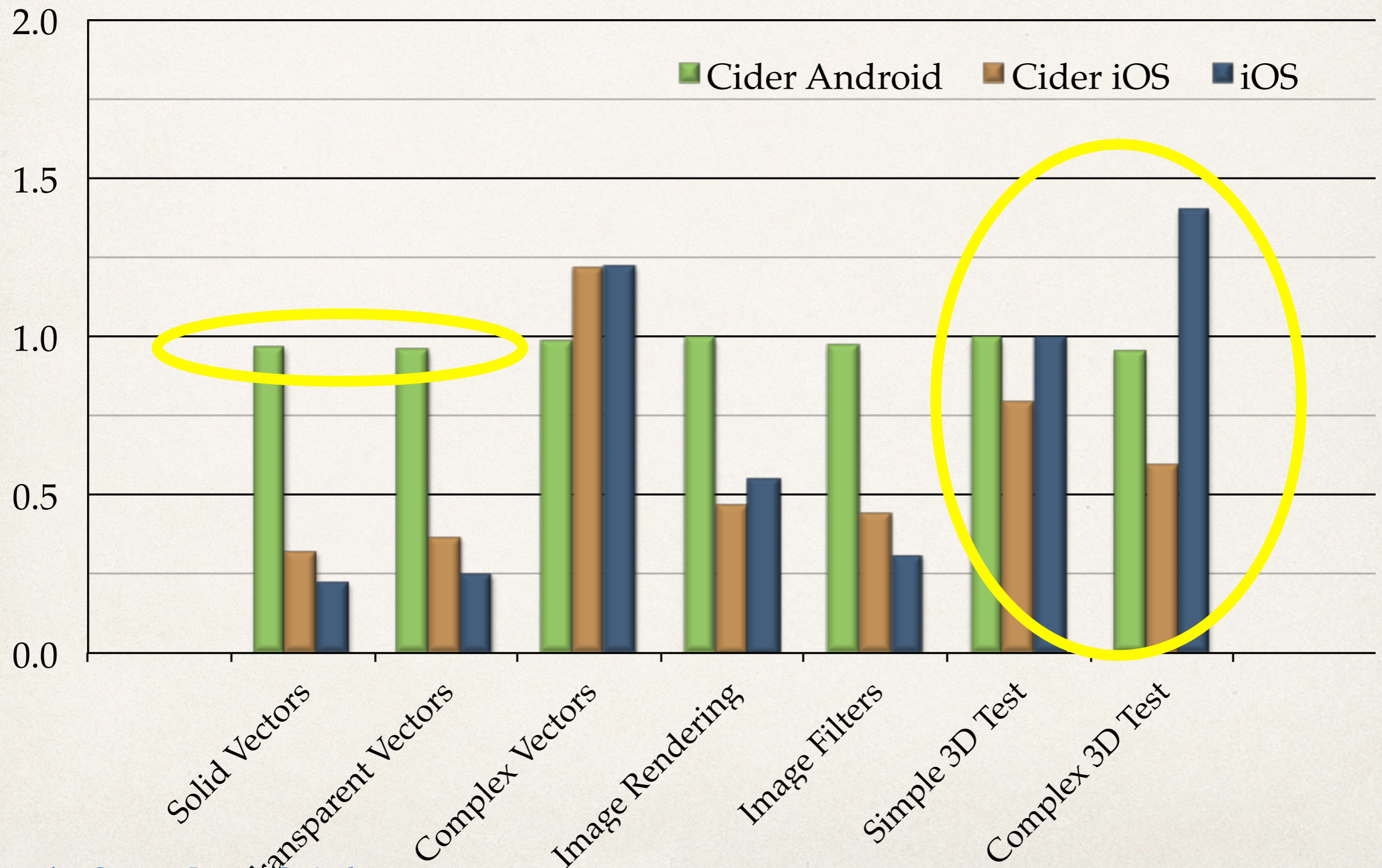
Cider: Experimental Results

PASSMARK BENCHMARK



Cider: Experimental Results

PASSMARK BENCHMARK



Conclusion

- ❖ Direct execution of unmodified iOS apps
 - ➔ Per-thread Personas
 - ➔ Duct Tape
 - ➔ Diplomats



Thank You



<http://systems.cs.columbia.edu/projects/cider>

Logo design by: Steve Lovelace (<http://steve-lovelace.com/>)