

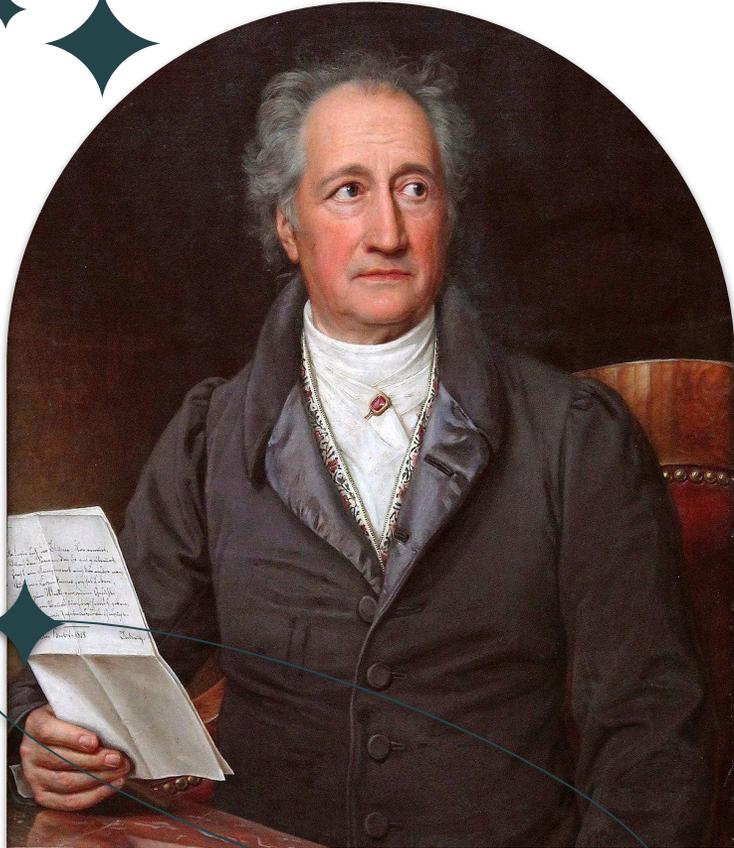


Five Mysteries In Embedded Linux

Don't be the Sorcerer's Apprentice!

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05.02.2022 - FOSDEM 2022

The Sorcerer's Apprentice



“Der Zauberlehrling”, a famous poem by J. W. Goethe

- ◆ SA is home alone, and tries a spell of his master. To save him the chore of fetching water, he enchants a broom to do it.
- ◆ Once enough water has been fetched, he can't stop the broom.
- ◆ SA tries to smash the broom with an axe.
- ◆ The splintered parts continue to fetch water, now even faster as it is more of them.
- ◆ SA cries for help.
- ◆ Sorcerer returns and quickly stops the broom.
- ◆ SA learns to not use forces he can't control.





Do not tinker with powers you do not fully understand

In Embedded Linux that means:

“Don’t base a product on things that feel like simple *magic*.”



Let me help you to not be the Sorcerer's Apprentice!

◆ Josef Holzmayr

Head of Developer Relations at mender.io

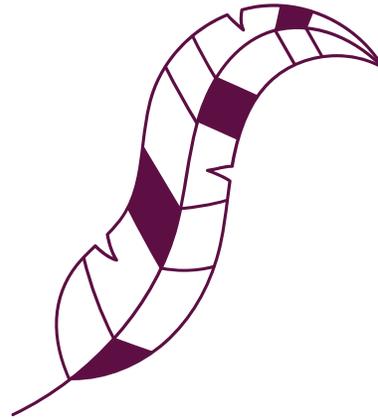
Yocto Project Ambassador
OpenEmbedded Social Media Manager
Gitpod.io Community Hero

Guilty of most sins in this presentation myself

◆ Contact Me

✉ josef.holzmayr@northern.tech

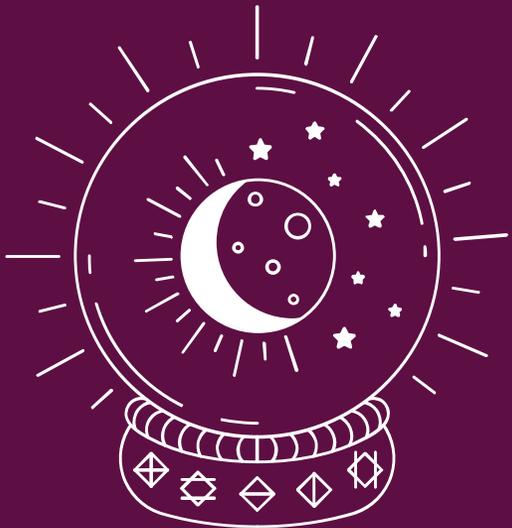
🐦 @TheYoctoJester





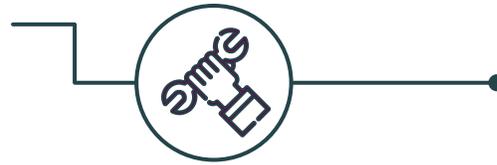
Mystery 1: Manual compilation

"This doesn't cross compile, I'll just build it in-target"



Mystery 1: what actually will happen

Your manually compiled dependencies stack up



You end up with a very fragile build process



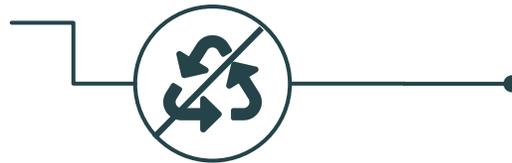
Suboptimally (read: "un-")documented



Execution-/Executor-dependent



Completely unreproducible



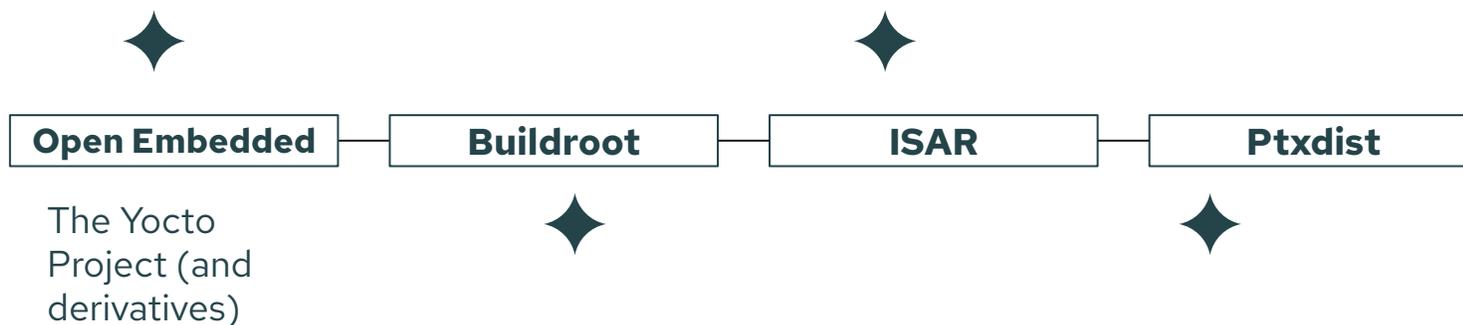
On the next maintenance iteration a few months later
you are in trouble deep.



Mystery 1: what the Sorcerer does

Always use a build system that integrates all of your application stack.

Prominent Options



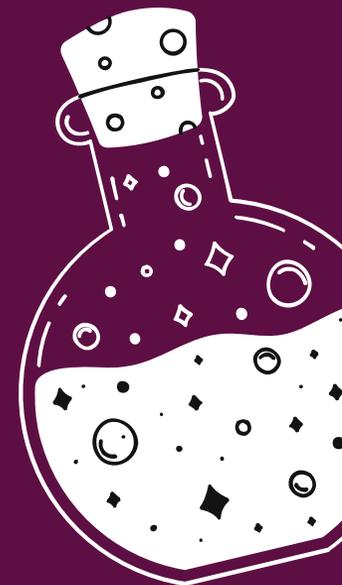
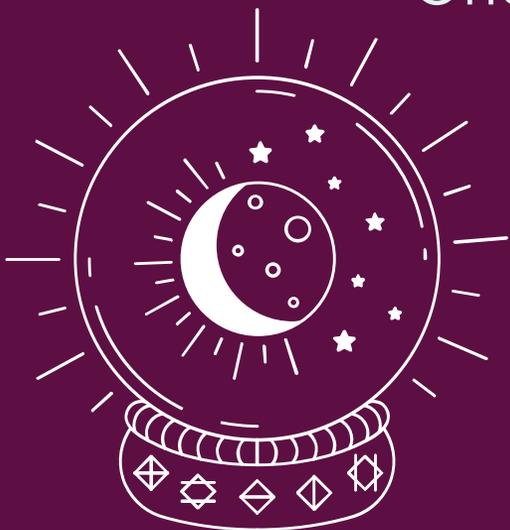
The initial learning curve and integration cost might seem expensive, even prohibitive. It is all but that.





Mystery 2: One image is golden

"Once we're happy with the target, we just copy and ship it"



Mystery 2: what actually will happen

Accidentally

You accidentally ship assets or information



Forget

On the next iteration, you forget some steps



Activated

Debugging is left activated

Backdoor

You have a deployed a perfect backdoor



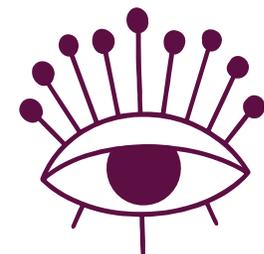
Mystery 2: what the Sorcerer does

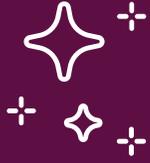


**The build system isn't just about cross compiling.
Use it to handle:**

- Variants in the software, like a debugging version
- Different hardware platforms

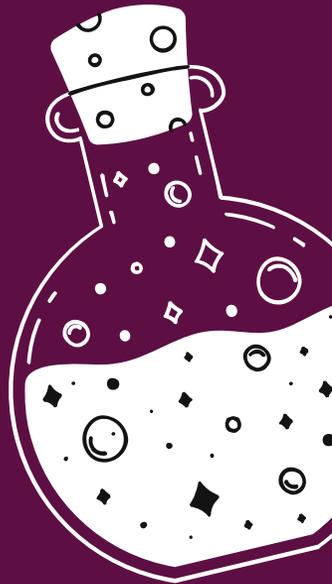
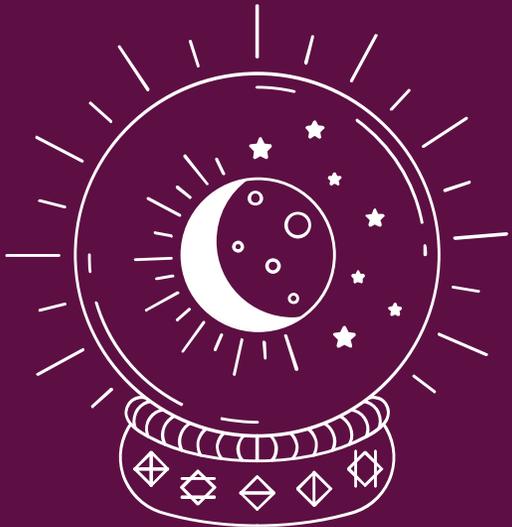
Always deploy directly from it, or at least through a completely automated pipeline.





Mystery 3: Package Managers

"We add apt and then use the Ubuntu repositories"



Mystery 3: what actually will happen



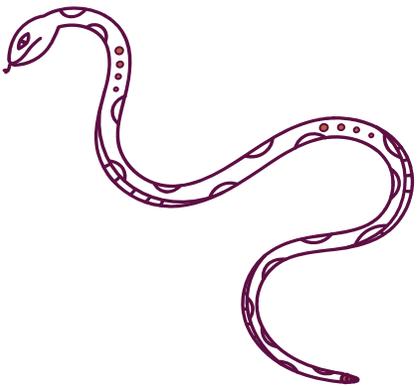
Waste You probably waste a lot of time



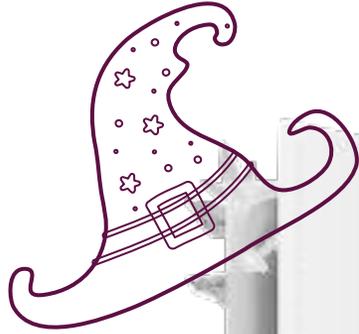
Don't Hopefully you don't get it working



Errors But if you do, you end up with a hell of errors or segfaults



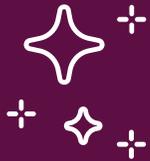
Mystery 3: what the Sorcerer does



**A distribution is the ABI/API that applications see.
Just using a common package format does not
make those compatible.**

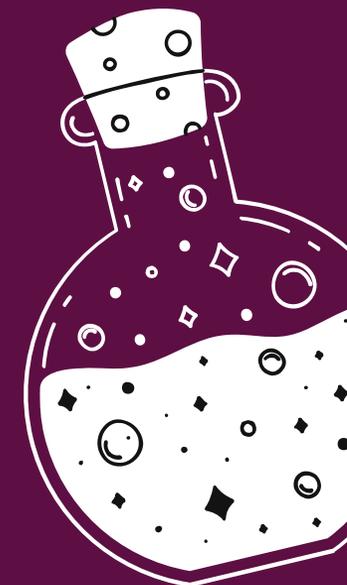
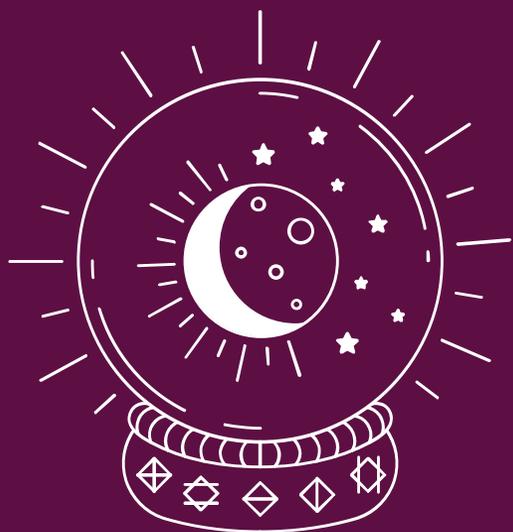
**Never mix binaries from
different distributions.**





Mystery 4: Configuration

"That's easy, just type those 4 commands!"



Mystery 4: what actually will happen



Repeating

Some poor soul on your manufacturing floor end up repeating tedious steps.



Unusual

When something unusual happens, you are called.



Inefficient

It just doesn't scale at all.

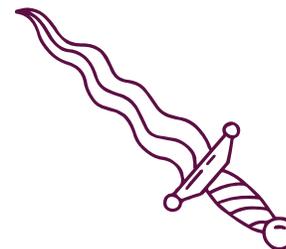
1 minute per device ?

10k devices per year ?

A full month extra ?

Congratulations, you just cost your company a full months salary extra. (roughly 21 days at 8 hours)

And 1 minute, thats really short. Try for yourself.



Mystery 4: what the Sorcerer does

Automate all configuration that ever happens. This has two aspects!

①

Manufacturing / Provisioning:

- setting MAC addresses
- injecting keys
- pre-registering with any service



②

Field Operation

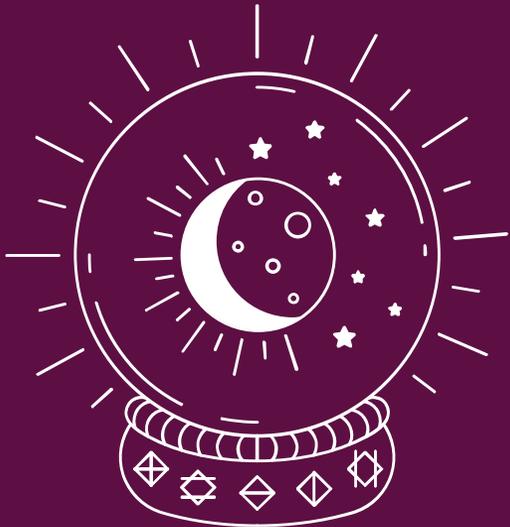
- nobody will attach a serial terminal cable!
- provide an in-application/managed means to adjust every relevant setting



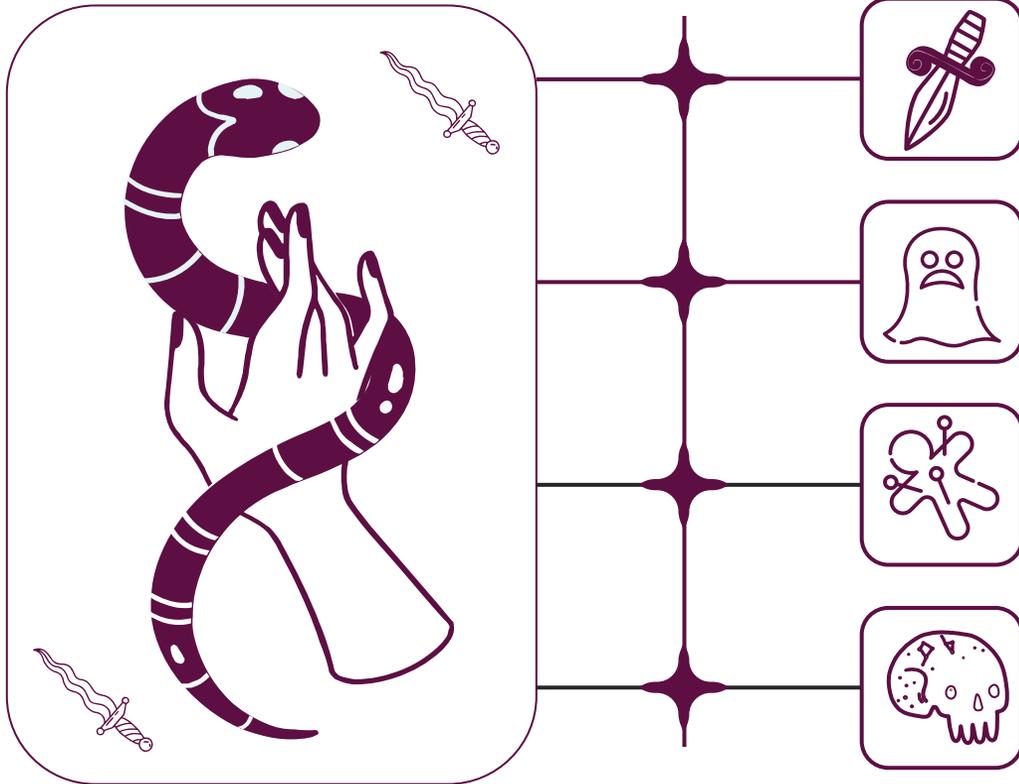


Mystery 5: Updates

"Flashing a new image, that's just 3 lines of shell."



Mystery 5: what actually will happen



In the best case scenario, the update process just doesn't work at all.

If you are being less lucky, it fails constantly on some devices.

Things can be worse, and you end up with bricked devices in the field.

In the worst case scenario, everything seems to be working fine - but you end up with silently corrupted/defective installations.

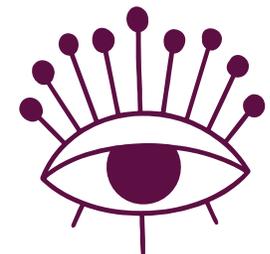
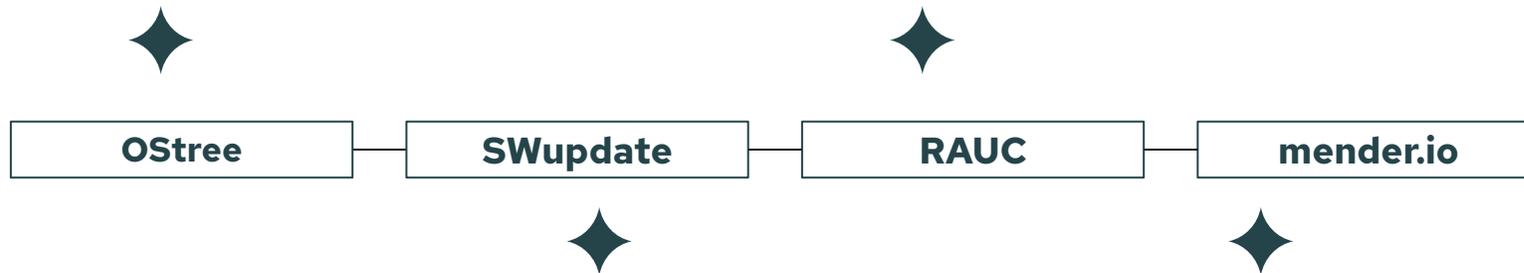


Mystery 5: what the Sorcerer does



Never ever home-brew your update mechanism!

Battle-proven solutions





The Master Sorcerer

**Magic is
sometimes
dangerous,
but useful.**

In Embedded Linux that means:

“Once you have an understanding of the whole system and lifecycle, you can avoid many pitfalls and create awesome things.”

and

“Just ask those who have already done things. They will help you!”



Learn more

Get started now

docs.mender.io/getting-started

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Thank You

Q & A

