



Lessons Learned Managing Nearly 1,000,000 IoT Devices

Embedded World 2024 - Austin, TX - 8th of October 2024



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3 questions

(1) Application?

(1) Application?

(2) Energy?

(1) Application?

(2) Energy?

(3) Connectivity?

(1) Application

(1) ~~Application~~

COMING SOON

(2) Energy

(2) ~~Energy~~ Device

Device

- What are your constraints?
 - ☐ environment (temperature, humidity, vibration, ...)
 - ☐ size? (mechanics?)
 - ☐ power (plugged? If not plugged → years of life?)
 - ☐ computation (later on software?)
 - ☐ storage (SD card?)
 - ☐ price
 - ☐ how many years are you going to produce your product? (EOL?)

Device

- Computation?
 - ☐ microcontroller
 - ☐ microprocessor
 - ☐ CPU
 - ☐ GPU
- ☐ Related to power

Device

- Energy?
 - ☐ low-power profiles in the hardware/software?
 - ☐ size/weight/logistics constraints? (can the batteries be shipped?)
 - ☐ certifications? (where are you going to sell?)
 - ☐ communication radios? (when sending/receiving?)
- Related to communications

Device

- Product
 - ☐ The EOL of your product matches the chip's EOL?
 - ☐ How to manage a multi-hardware product?
 - ☐ How to manage the software of a multi-hardware product?
 - ☐ Do you have access to the product?





(3) Connectivity

Connectivity

- How is the device connected?
 - ☐ Send and receive data? Only send? Only receive?
 - ☐ Bandwidth requirements?
 - ☐ Backup connectivity?
 - ☐ How many devices share the same connectivity?
 - ☐ Energy consumption?
 - ☐ Is the connectivity secure? (OTAs? Remote access?)
 - ☐ Is your device running offline most of the time?
 - ☐ Does it need any special antenna or sky visibility?



(1) Application

(1) ~~Application~~ **Software**

Software

- What does product do?
 - ☐ What type of application does it need to run? (stack? edge?)
 - ☐ Interact with peripheral devices? Ports? Display? UX?
 - ☐ Do you need operating system?
 - ☐ Accessible to the people?
 - ☐ Remote access? Remote Diagnostics?

Software

- Development

- ☐ How do you test new releases of software in your product? (multi-hardware)
- ☐ How do you virtualize your product?
- ☐ How do you update the software in the embedded devices? OS?
- ☐ How do you run CI/CD for your software?
- ☐ Can you schedule future updates?

Software

- Manufacturing
 - [] How do you provision your devices? (automatic? manual?)
 - [] When the first update happen? (how is it connected?)
 - [] What do you test at the end of the production line? (connectectivity?)
 -
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Software

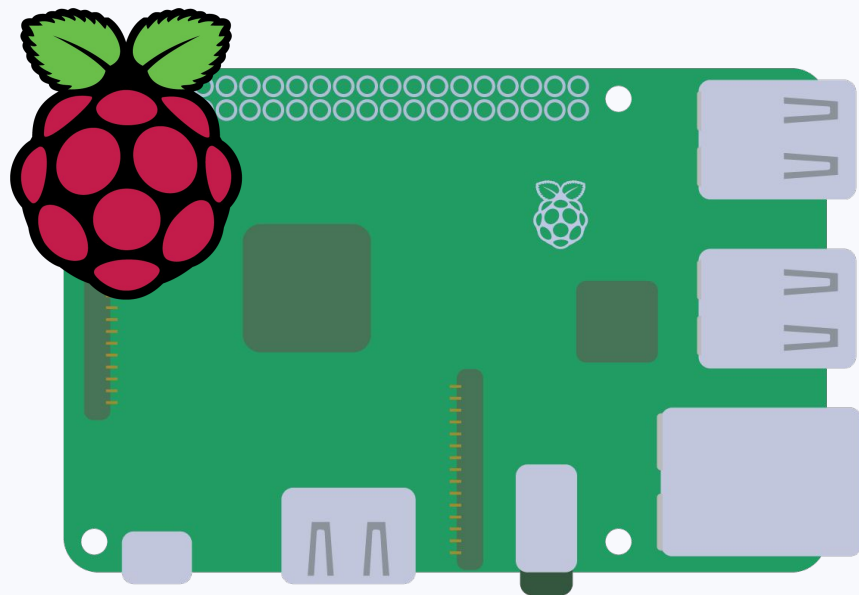
- Security
 - [] Secure Boot
 - [] Full disk encryption
- Configuration? Variables?
- Support

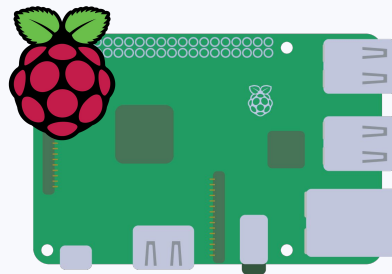
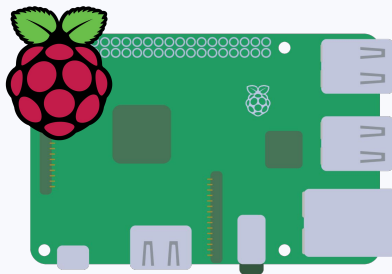
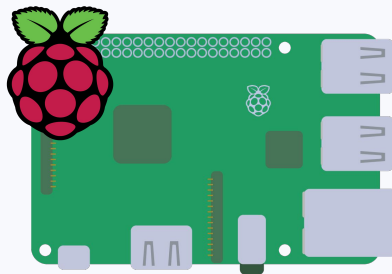
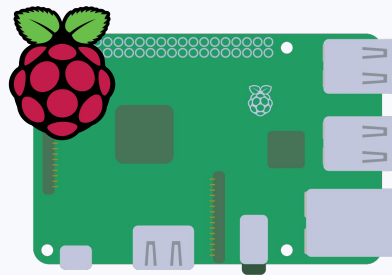
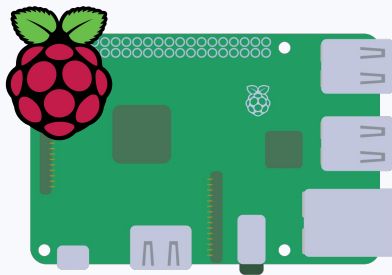
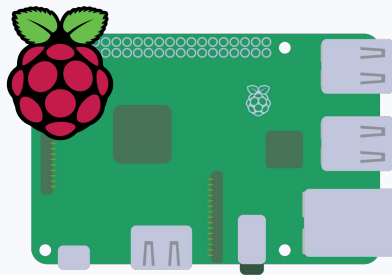
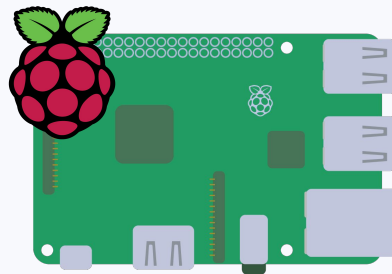
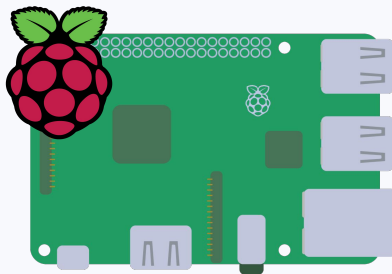
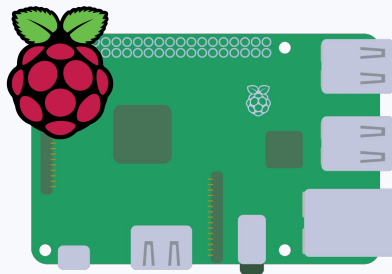


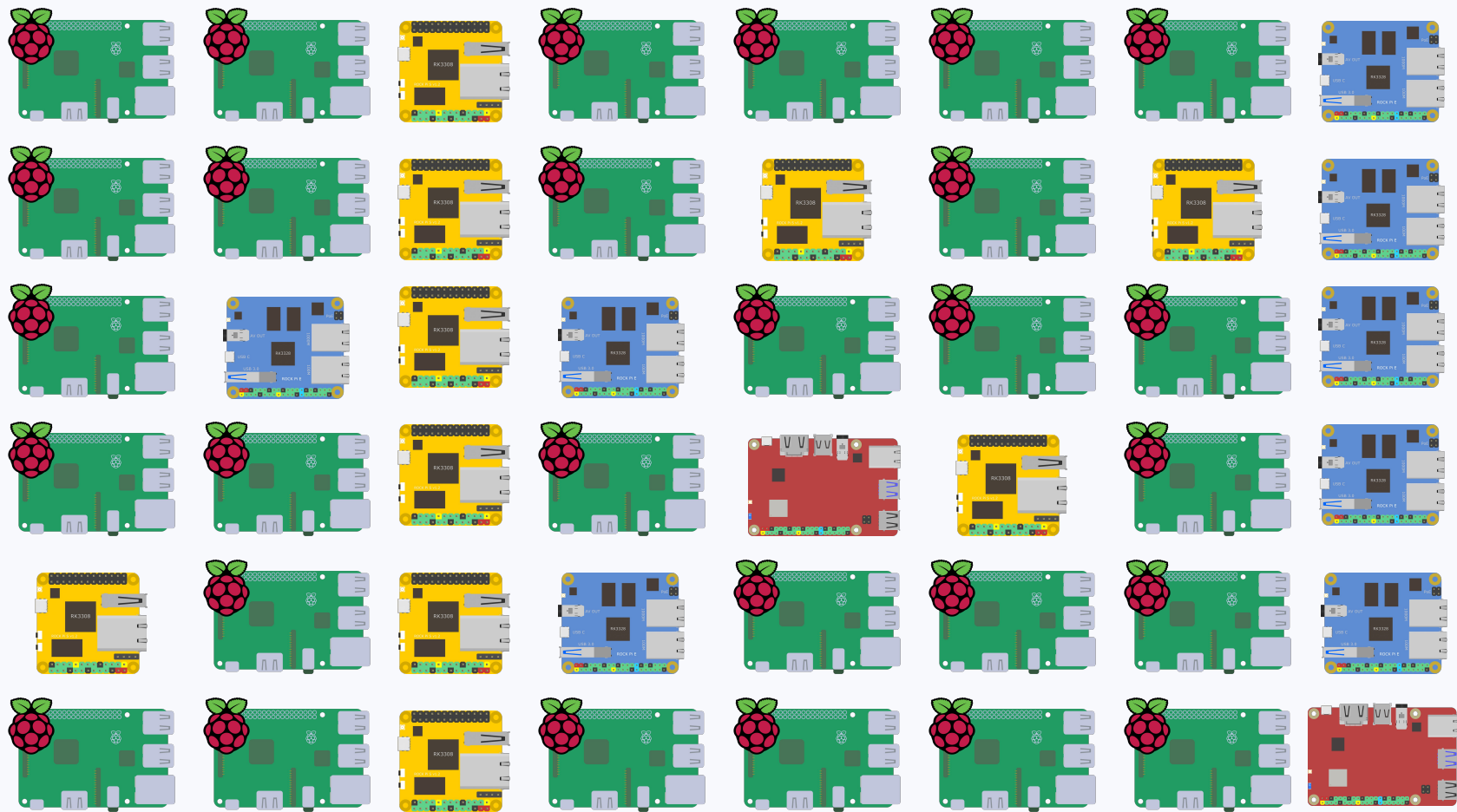
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Now, how do you
manage 5, 500, 50.000
or 500.000 of these?

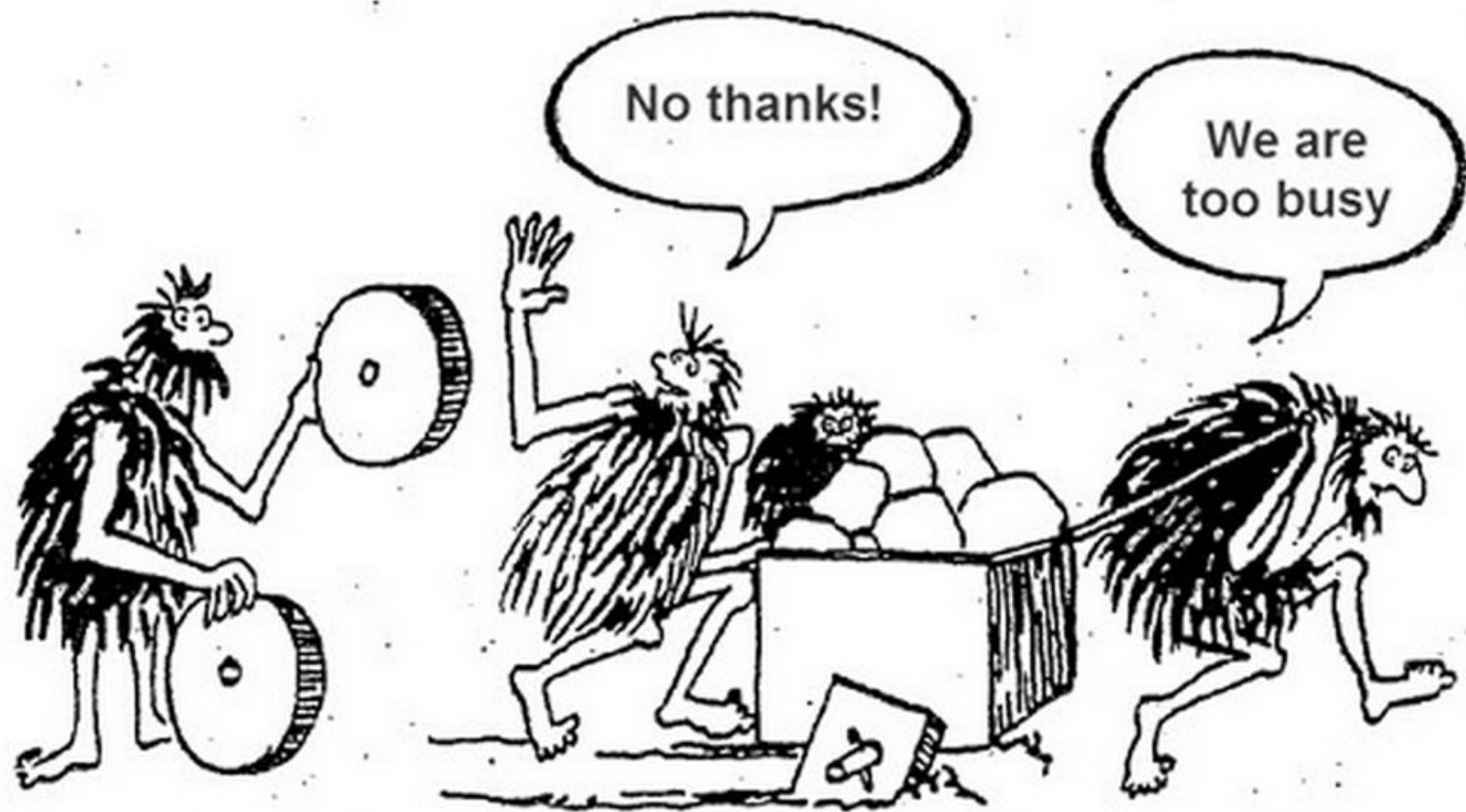
Your product needs 2 clouds (maybe 1?)

1. Data Cloud

2. Fleet Management Cloud

* **fleet owner** (n.): the person responsible for building and managing groups of connected IoT (Internet of Things) devices.

Why do every fleet
owner need fleet
management tools?



The Die Hard method...



T&E / M&S / W&A / H&A

A man with a beard and a light blue cap stands in a field, leaning on a long wooden staff. He is wearing a light-colored t-shirt with orange stripes on the sleeves and brown trousers. In the background, several brown and white cows are grazing. To the left, a small black and tan dog stands alert. The scene is set in a grassy field with a line of trees in the distance under a clear sky.

PET vs CATTLE

Why do every fleet owner need fleet management tools?

1. Software and HostOS updates.
2. Device Management Tools (provisioning, FDE, SSH, logs, diagnostics, and more)
3. Take advantage of modern tools (containers, CI/CD, open source and more)

A photograph of three young women standing in a field of colorful flowers, seen from behind. They are embracing each other in a supportive manner. The woman on the left has long dark hair and wears a light blue floral blouse and denim overalls. The woman in the middle has long brown hair and wears a grey knit top. The woman on the right has short brown hair and wears a red and white striped shirt and denim jeans. The word "SUPPORT" is written in large white capital letters across the center of the image.

SUPPORT

Lessons Learned ...

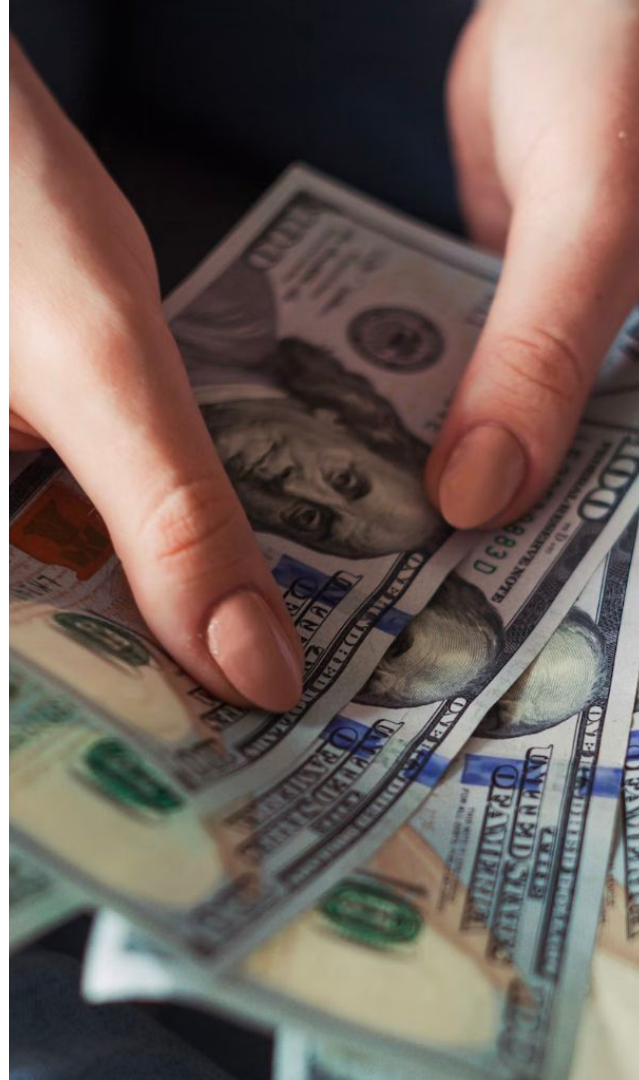
On the IoT there is
no silver bullet...

- Device
- Connectivity
- Software

- Do not reinvent the wheel.
- Work with great **partners** and production grade hardware.
- Embrace open source and avoid **lock-in vendor** solutions.

One last thing...

One last thing...



Business Models

- Challenges with the IoT monetization (higher costs, unclear benefit, new biz models)
 - [] How do you monetize a digital product?
 - [] How do you manage the new costs?
 - [] How do you convince your customers to move from CAPEX to OPEX?
 - [] What is your sales channel?
 - [] What should you do with the generated data?
 - [] How do you adapt to the new business models innovations?
 -

- Do not reinvent the wheel.
- Work with great **partners** and production grade hardware.
- Embrace open source and avoid **lock-in vendor** solutions.
- **Work with a profitable business model in mind.**

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