Experiences from integrating 100 things

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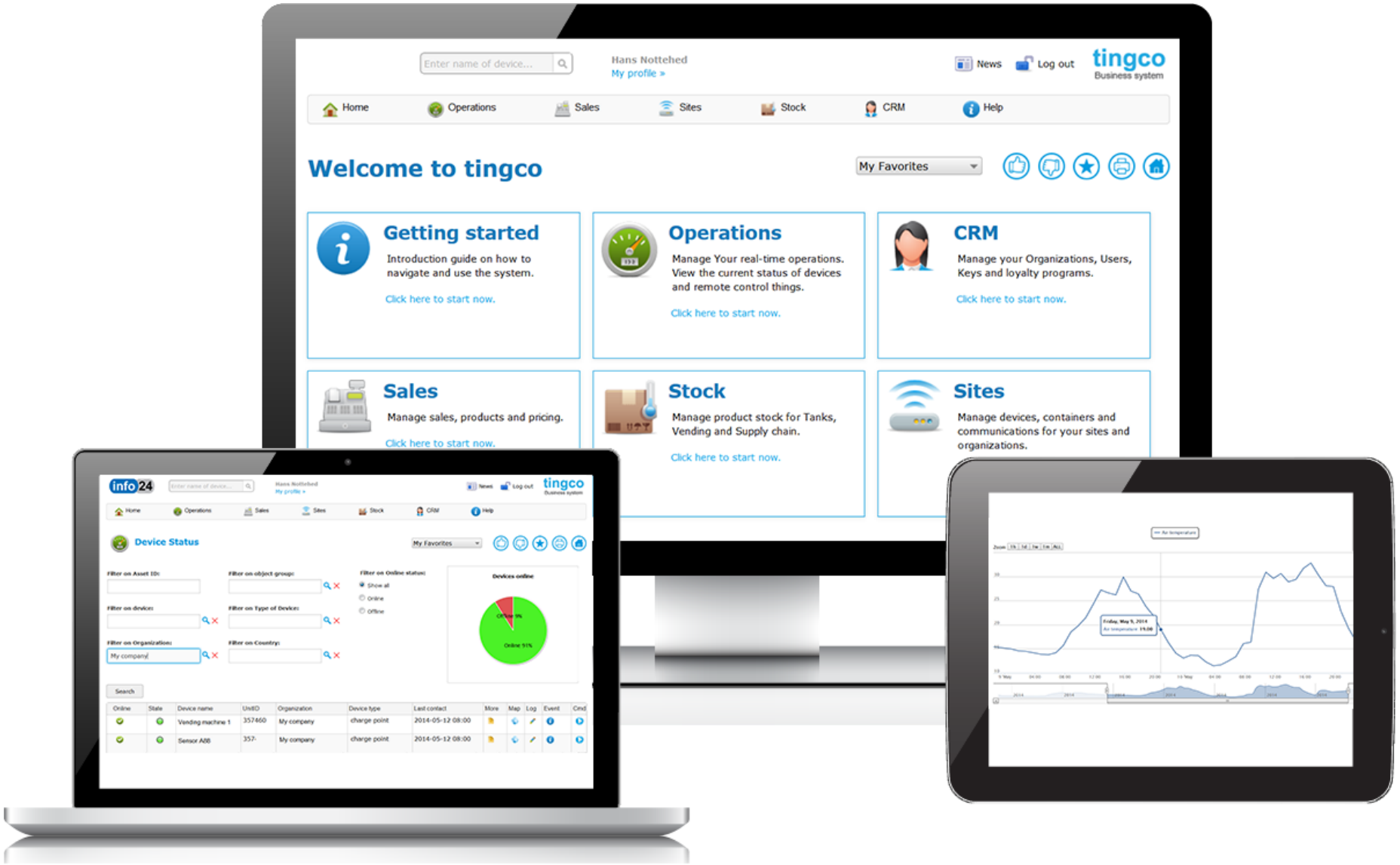
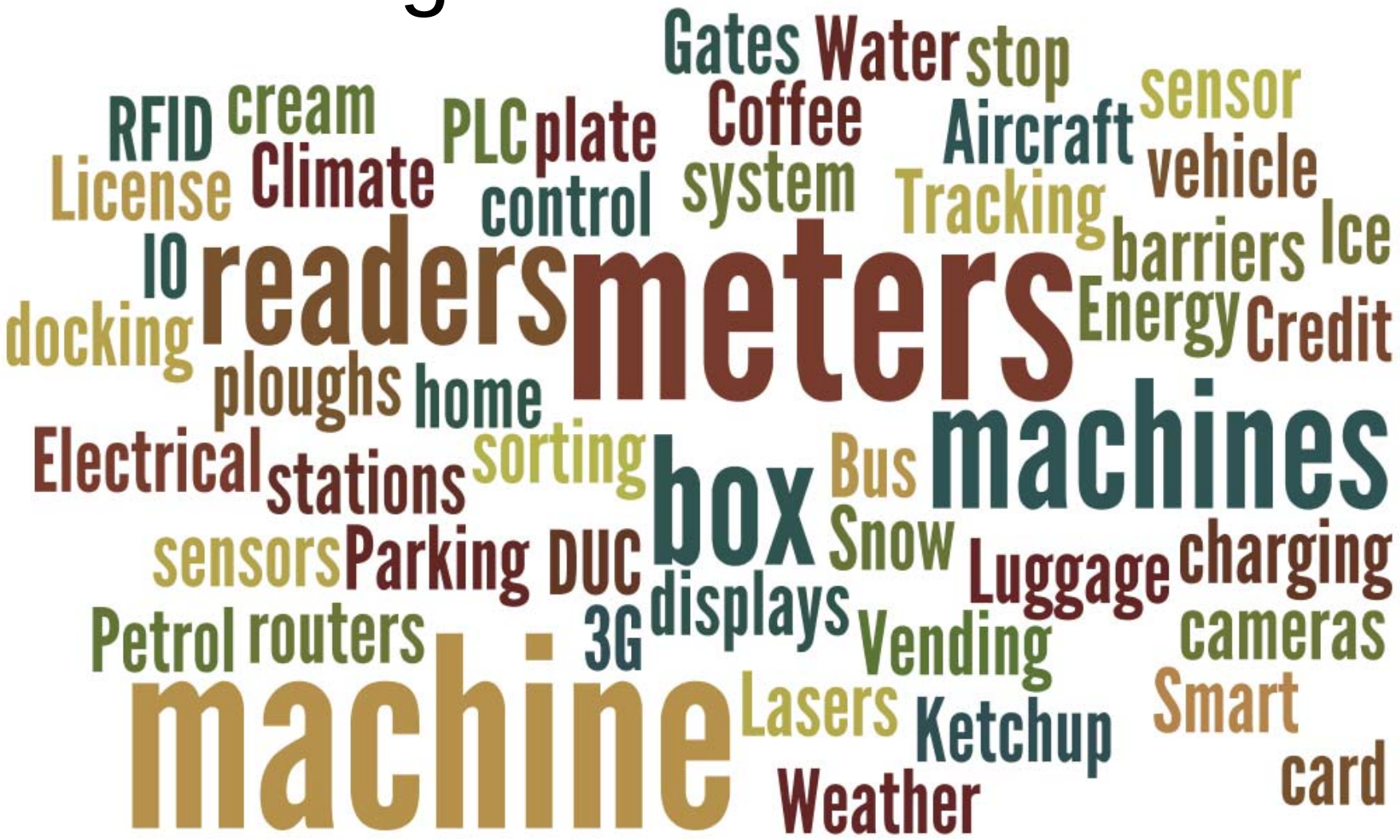
Tingco – Cloud based business system for connected things



tingco BUSINESS SYSTEM FOR CONNECTED THINGS

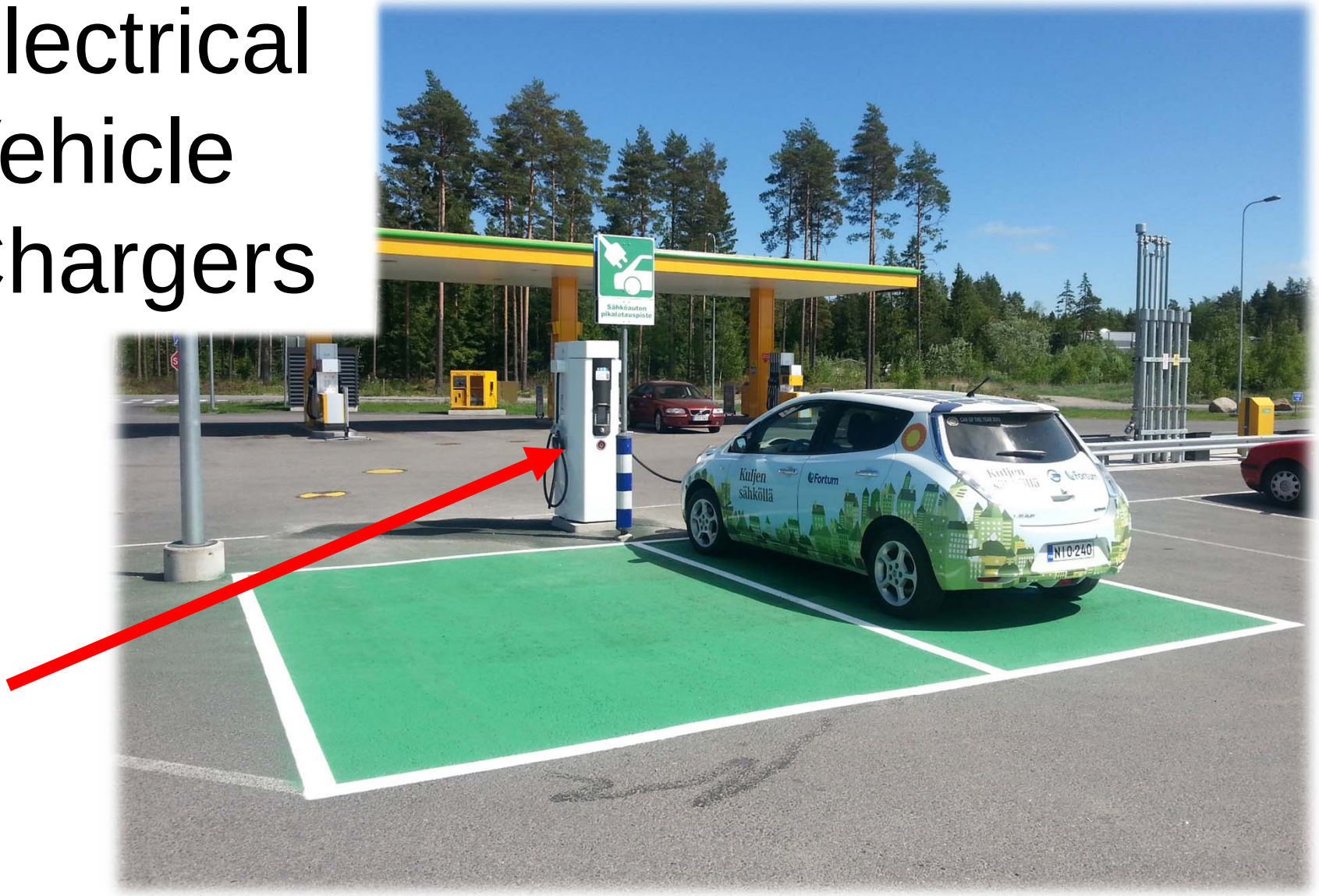
Open – Coding in Java – App Market – Cloud monitoring

100 Things?



Vending machines

Electrical Vehicle Chargers



Bus stop displays in Malmö / Lund

Road traffic sensors

City bike stands in Örebro

Newspaper stands

The biggest problem with Internet of Things are the

THINGS!

“I want to connect the ventilation system online”

“I want to reduce my energy consumption by 35% and at the same time improve the indoor climate.”

Everything is connected!

–

Now what?

Not invented here syndrome

Why develop something new when a solution already exists?

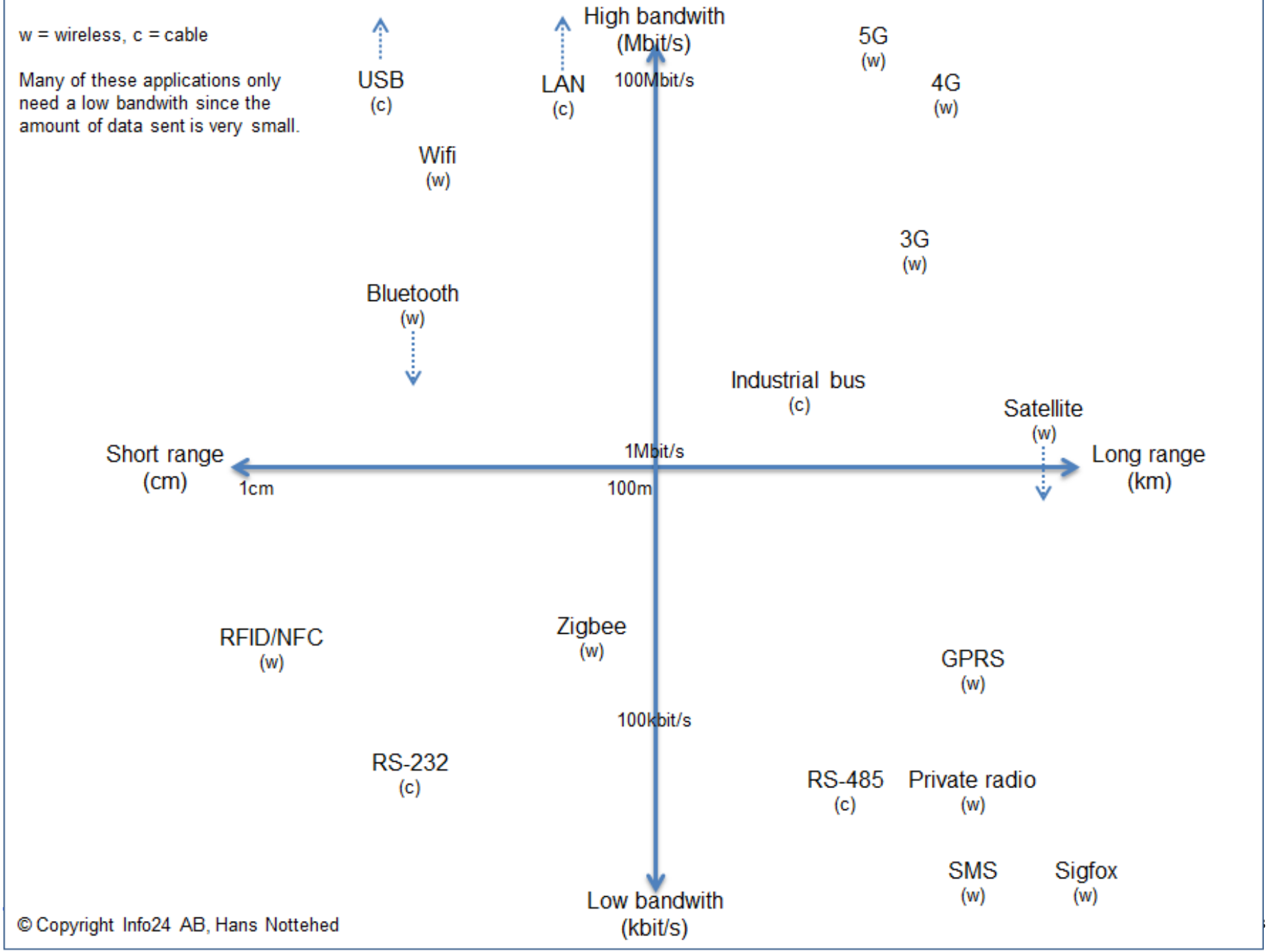
Electrical Vehicle Charging

How to connect a thing?

- Select the best network technology and API for the type of device and application

- Do you need 4G to send 2 bytes of sensor data?

General overview of two-way modes of communication often used in Internet of Things applications.



Don’t trust the network

- Mobile operators optimize the network and disconnect sessions at will
- Roaming SIM = often low priority
- The thing/device must have a very robust re-connect handling (usually very poor)

SIM-card cost control

- Warning!!! - SIM-card invoices of up to 75.000 SEK and more!

Offline !!!

- We have good networks but …
- Don’t assume the network will be online all the time
- The device as well as server must handle offline scenarios

Think Mars rover

- Many professional devices are still developed with a consumer mindset – “Please reboot”

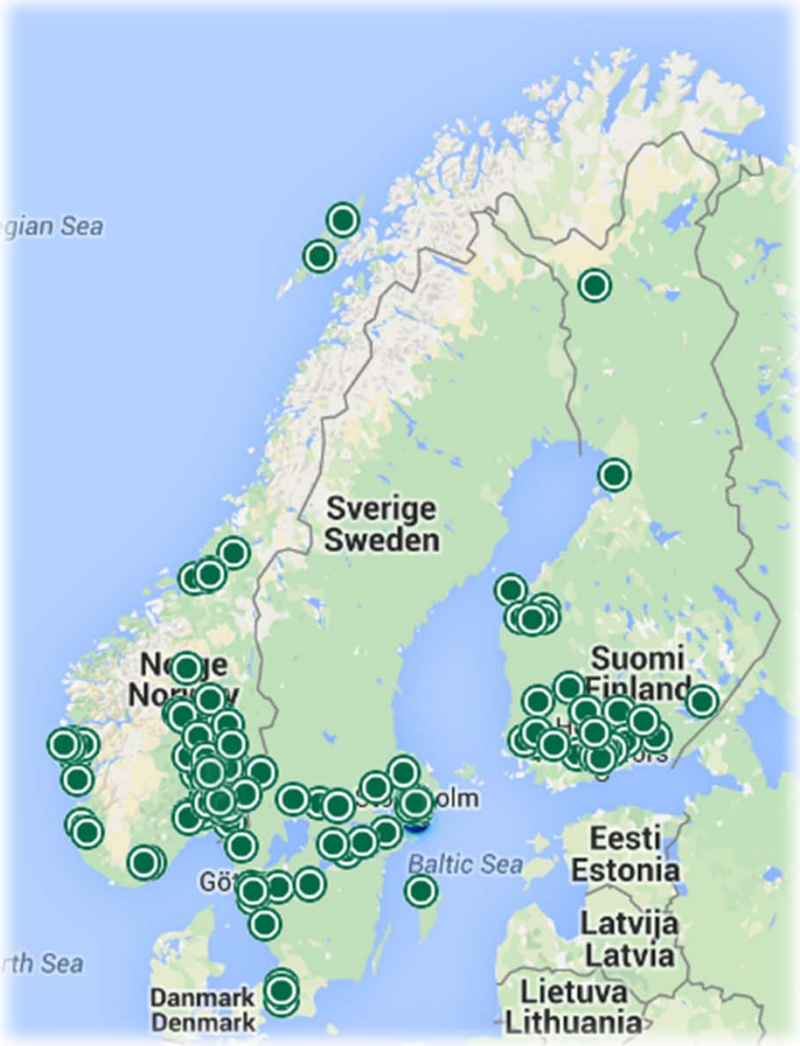
Watch-dogs save money

- Automatic restart of the device if it hangs/crashes should be a standard feature

Remote software updates

- There will be bugs
- There will be changes
- Security updates

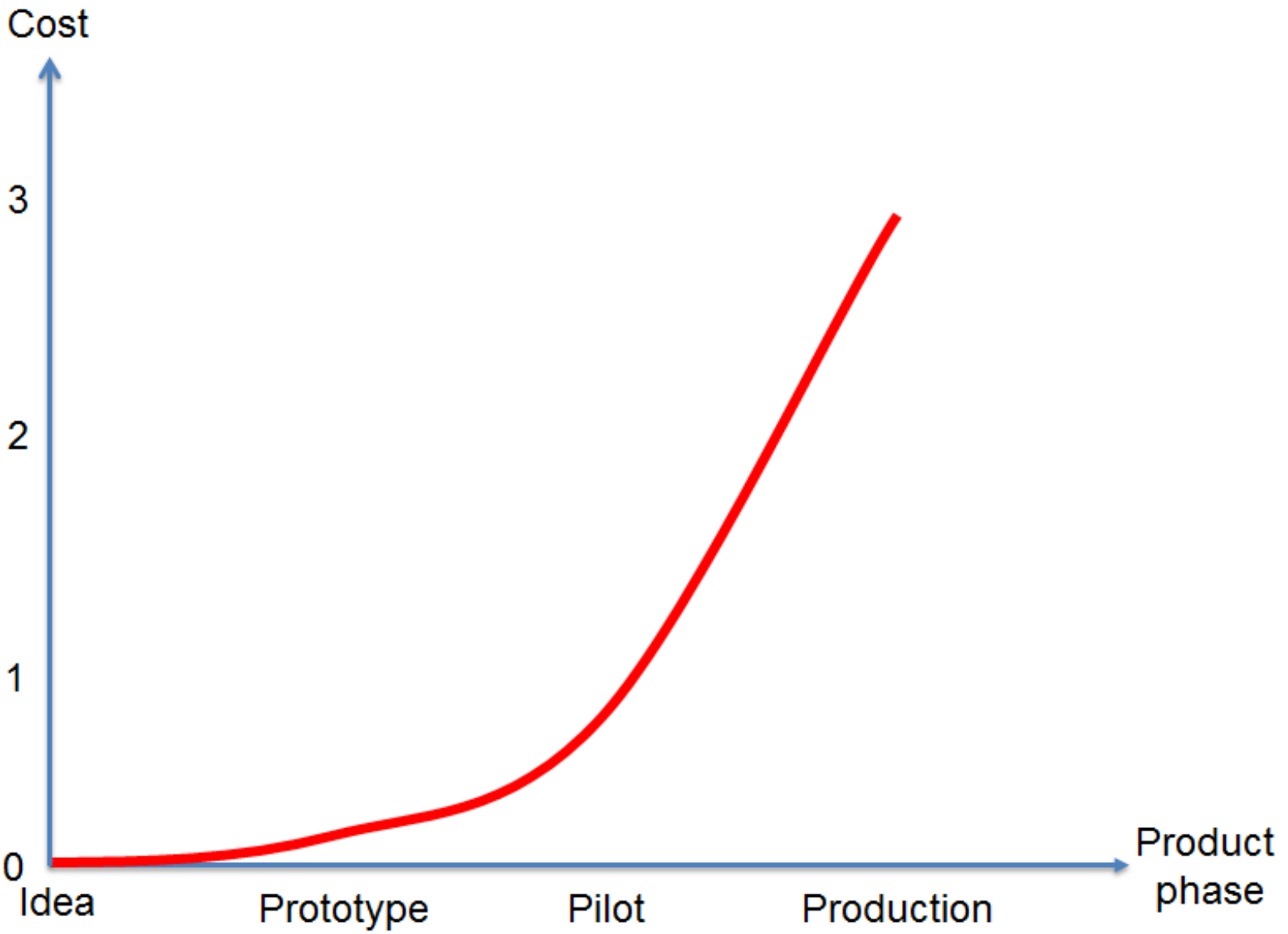
- …but don’t share file server with admin department



Remote management

- Remote Monitoring
- Remote Control

Cost of fixing a problem in a product



Security is often missing

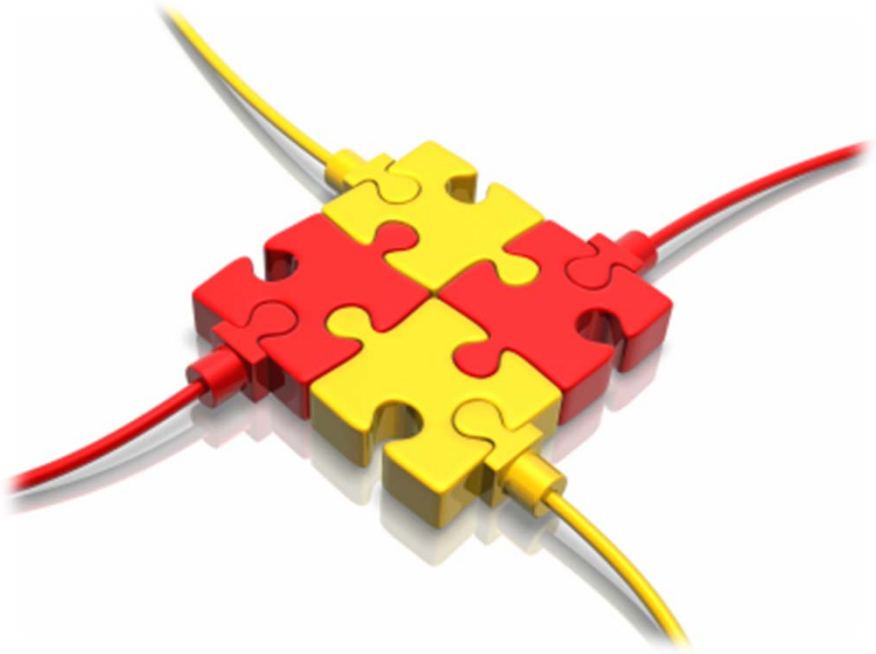
- Do you know what devices that connect to your system?
- Do you know the data they send are correct and not tampered with?
- Is the data sent as clear text like a “postcard” = not encrypted

Personal integrity

- Devices collect more data than needed for its intended purpose
- Devices leak sensitive data

Over-engineering

- The designing of a product to be more robust or complicated than is necessary for its application



Protocols

- Byte/size optimization
- Standards vs. do it yourself

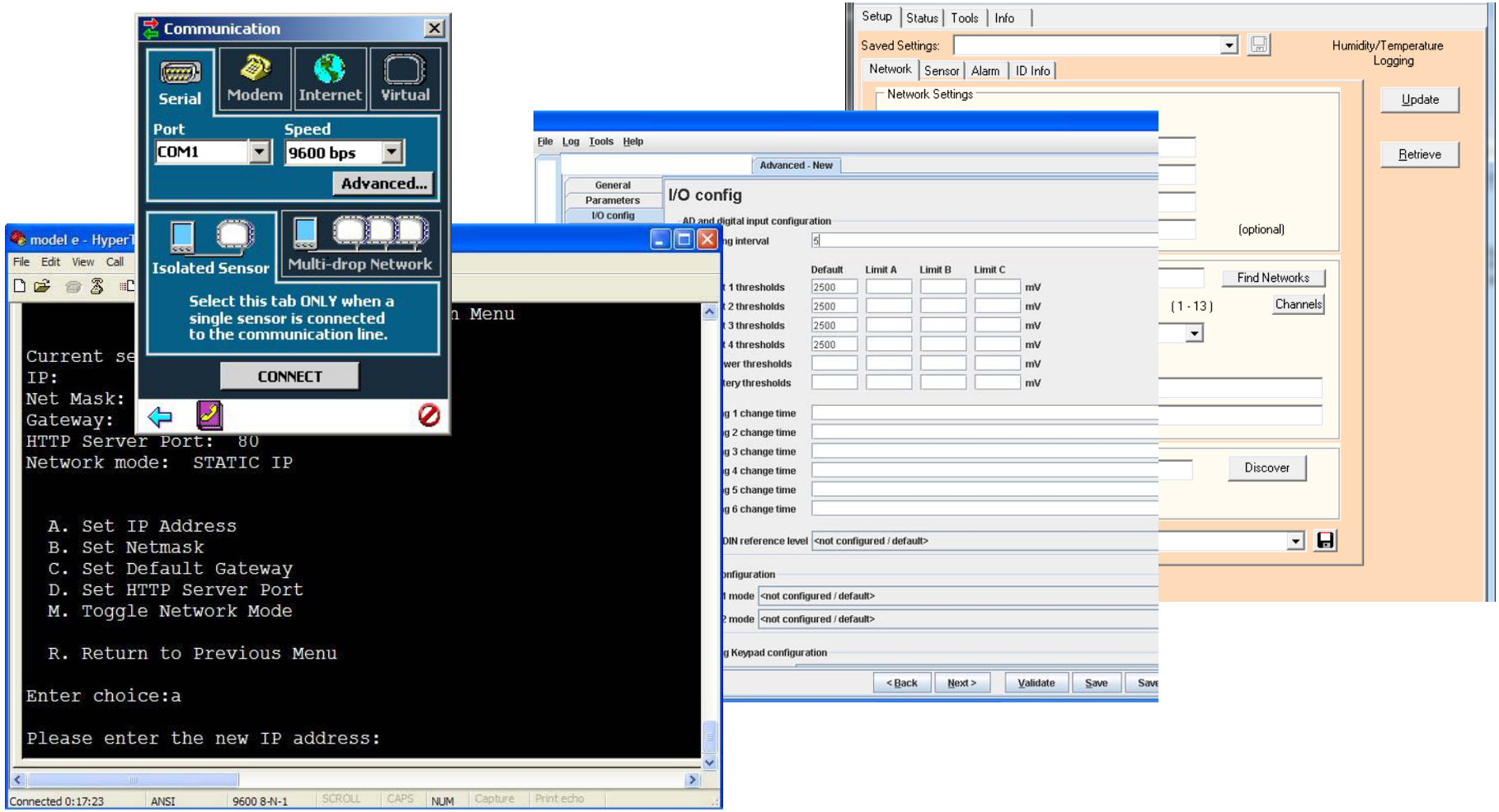
Popular transport protocols

- TCP sockets
- MQTT
- XMPP
- http(s)
- ftp

User interaction

- Users don't do what you expect them to
- Users don’t understand what you do

Give the admin gui some love



Doing your own web portals

- Expensive
- Takes time to implement
- Have to maintain it over time
- Customers get multiple screens

One device Apps

- Every device has its own App

- It’s fun for you - but very annoying for the customer

Open data vs. closed data

- Sharing seems to be scary

Raspberry Pi is NOT cheap

- No watch-dog
- Raspberry Pi 30 EUR
- Case 20 EUR
- Power supply 50 EUR
- Memory card 6 EUR
- Wifi dongle 40 EUR
- 3G board 60 EUR
- Digital IO/relay board 50 EUR

No sense of design

Thank you. Questions?

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