

ENGINEERING KIOSK

Innsbruck, 19.12.2024

MY BACKGROUND

whoami

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Degree in CS at University Innsbruck

Job

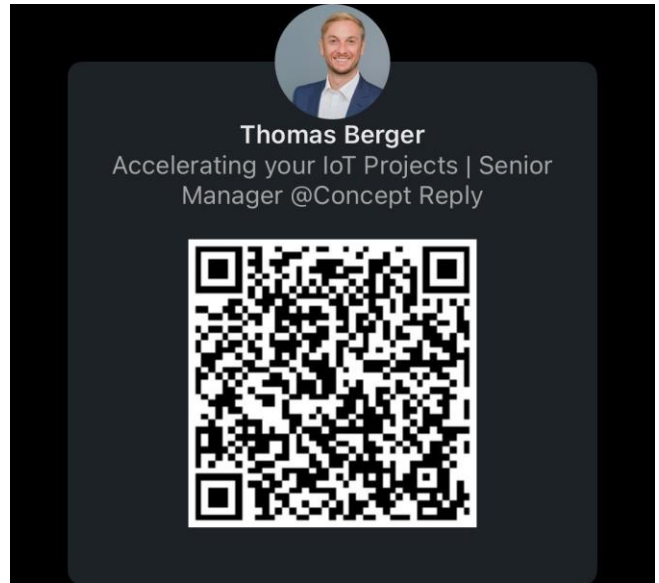
- Senior Business Unit Manager @ Concept Reply

Interests

- IoT, Agile methodology, Paragliding

Contact

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AGENDA

What can you expect today?

- 1 **OTA Firmware Update**
- 2 **The Reply Group / Concept Reply**
- 3 **FOTA IoT Cases**



OTA FIRMWARE UPDATE



FOTA UPDATE

What is it about?

explain FOTA in one sentence

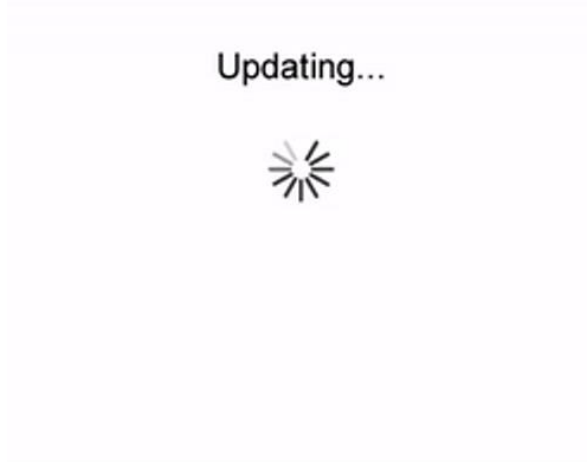


FOTA (Firmware Over-The-Air) is a technology that enables remote wireless updates of a device's firmware to improve functionality, fix bugs, and enhance security.



FOTA RELEVANCE (1/2)

Where is it utilized?



FOTA RELEVANCE (2/2)

Is it a security measure?

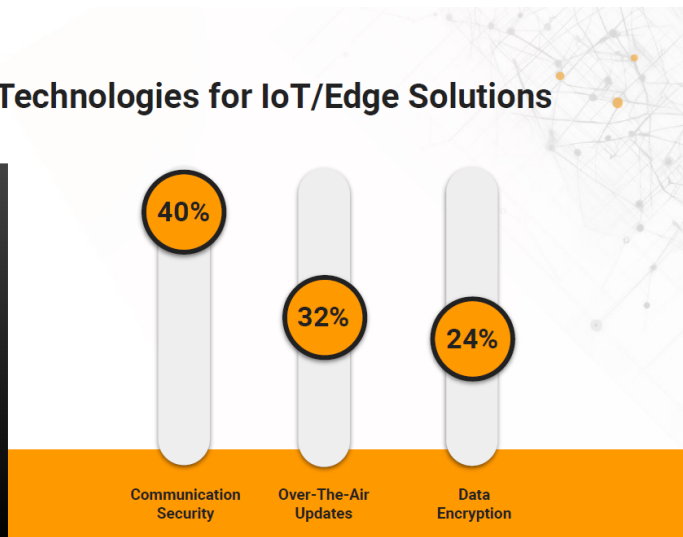
Eclipse Foundation

2024 IoT &
Embedded Developer
Survey Report

Most Favored Security Technologies for IoT/Edge Solutions

Communication security (40%)

remains the top security technology, seeing a slight increase from 39% in 2023. **Over-the-air updates** surged to **32%**, up from 24%, making it the second most popular choice. **Data encryption** remains stable at **24%** (up slightly from 23%).



Q: Which security-related technologies do you use on your IoT/edge solutions: (Select up to three)



MAJOR ADVANTAGES

What to expect from FOTA updates?

- Security
 - reduction of physical interfaces, fixing vulnerabilities faster
- Firmware management on the backend (incl. monitoring)
- Time to market
- Cost efficiency
 - Less physical interaction, less downtime and manual work



FOTA PLAYERS

What do I need to set it up?



Cloud

- Cloud storage for firmware
- Optional device shadow or state



Trusted Third Party

- PKI (cloud, on-prem, 3rd party)
- Birth/claim certificate (trust between device and cloud platform)



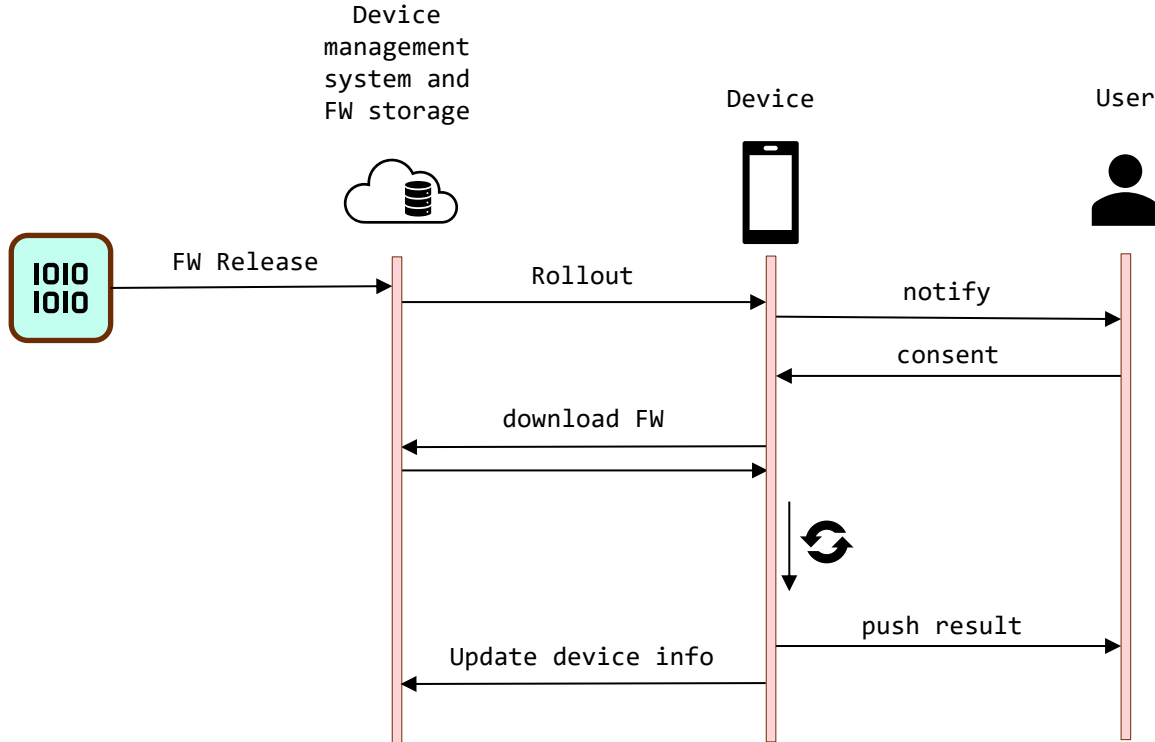
Device

- Radio module (5G, WiFi, Bluetooth, ...)
- Device provisioning (registering device to cloud)



BASIC WORKFLOW

How to perform a FOTA update (device centric)?



Looks pretty easy, isn't it?



MAIN CHALLENGES

What could probably go wrong?



Communication

- Secure channel (HTTPS/MQTTs)



Data integrity

- Signed firmware with digital signature
- Validate received firmware image (checksum, MD5, ...)



Device integrity

- Defined workflow (state machine) including recovery branches
- No dead ends



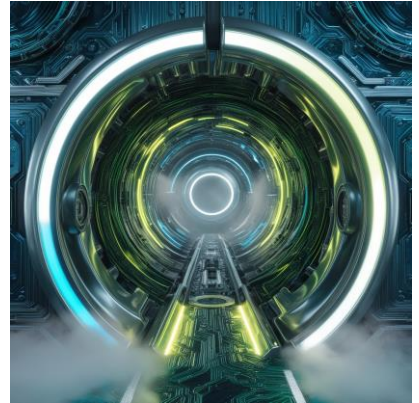


SECURITY MECHANISMS (1/2)

How to secure the data transmission?

Provide secure communication

- Cryptographic protocols: MQTT**S** / HTTP**S**
- Crucial to use latest protocol stack: TLS 1.3
 - SSL 1, 2, 3 and TLS 1.0, 1.1 are deprecated
 - Faster handshake, less resource usage



SECURITY MECHANISMS (2/2)

How to secure the data?

PKI for device birth/claim certificates

- CA, CSR, certificate rotation workflow

Certificate management on device

- Secure creation and storage of certificates
 - HSM / TrustZone / Memory Protection Unit



DEVICE INTEGRITY

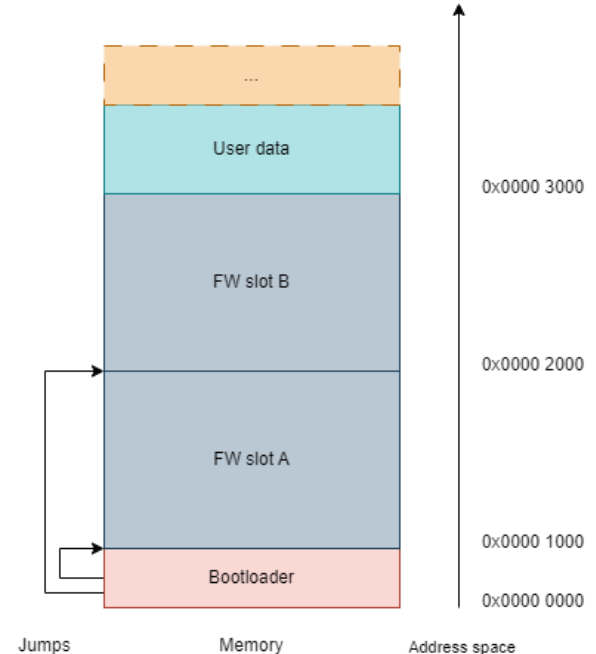
How to keep the device alive if something fails?

Bootloader

- Program started at bootup
- Holds information about the latest fw
- Initiates loading of the „main application“

Image slots

- Provide multiple slots for FW images (factory default fw, fw slot 1 and fw slot 2)
- Decide on update strategy (swapping start up address, static startup address -> copying images to start address)



RECOVERY STRATEGIES

What if something goes wrong?

Scenarios

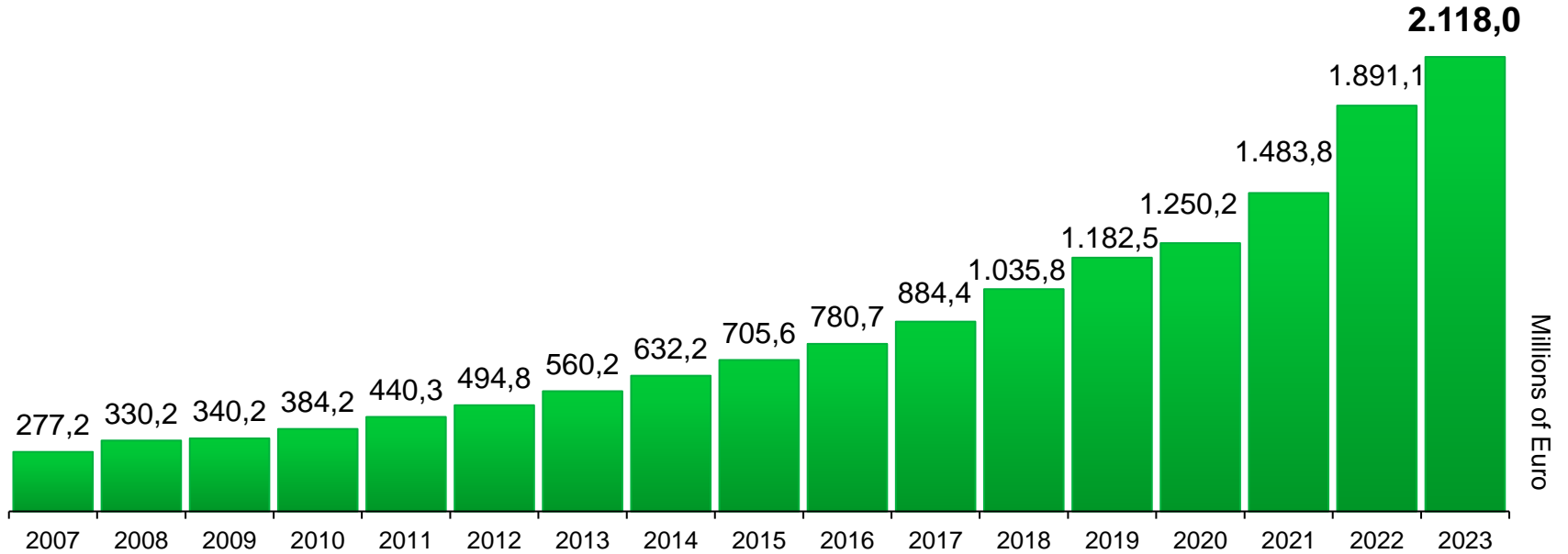
- Update request fails
 - No issue -> just try again later
- FW download fails
 - incomplete download, compromised FW, bitflip, ... -> keep image slot for next attempt
- Boot up fails
 - Incompatible image, migration issues -> try alternative slot or factory FW slot



THE REPLY GROUP



REVENUE & PEOPLE



2272 2686 2994 3149 3422 3725 4253 4689 5245 6015 6456 7606 8157 9059 10579 13467 14599

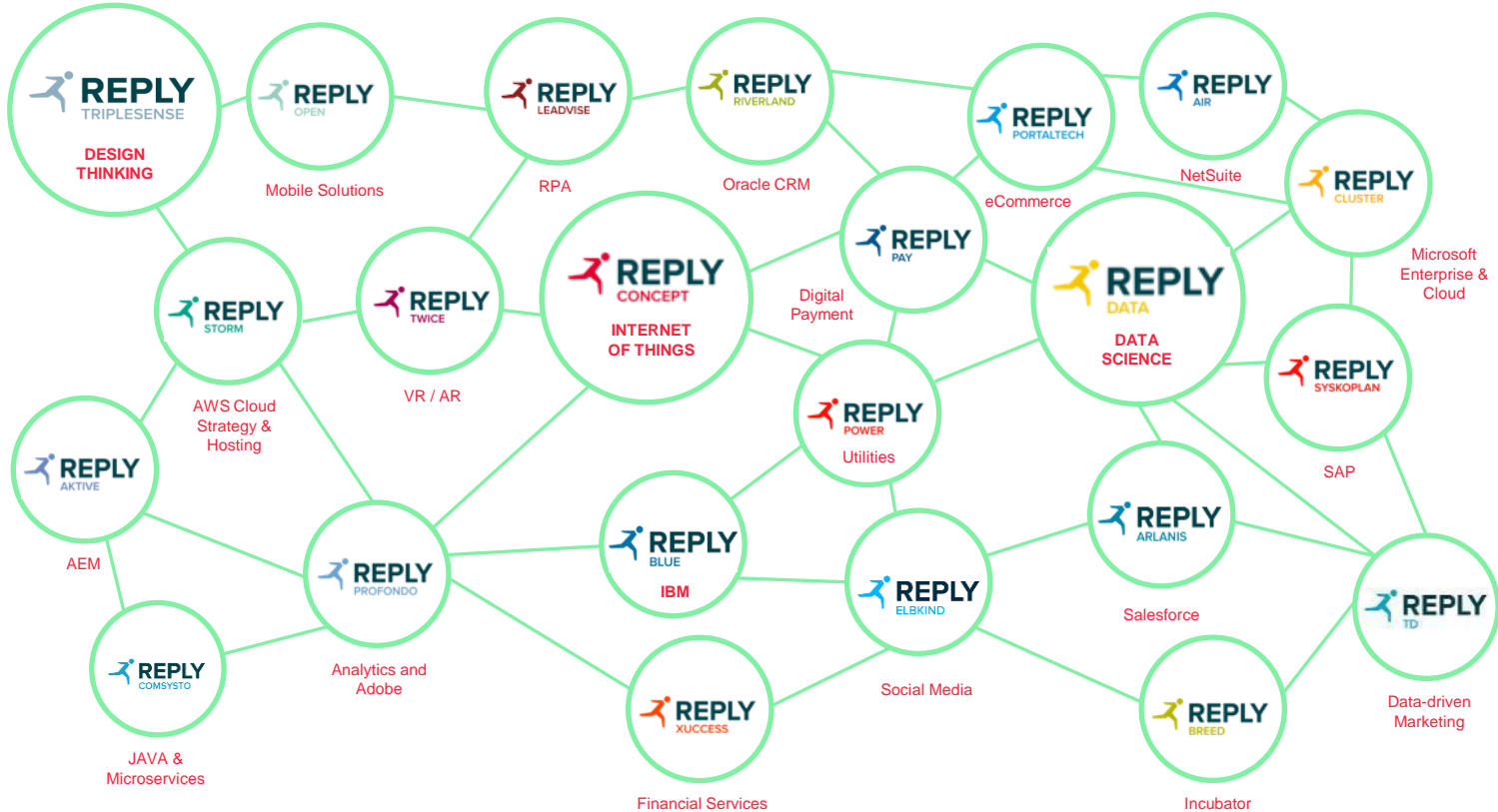


WHERE WE ARE



250+ BOUTIQUE FIRMS

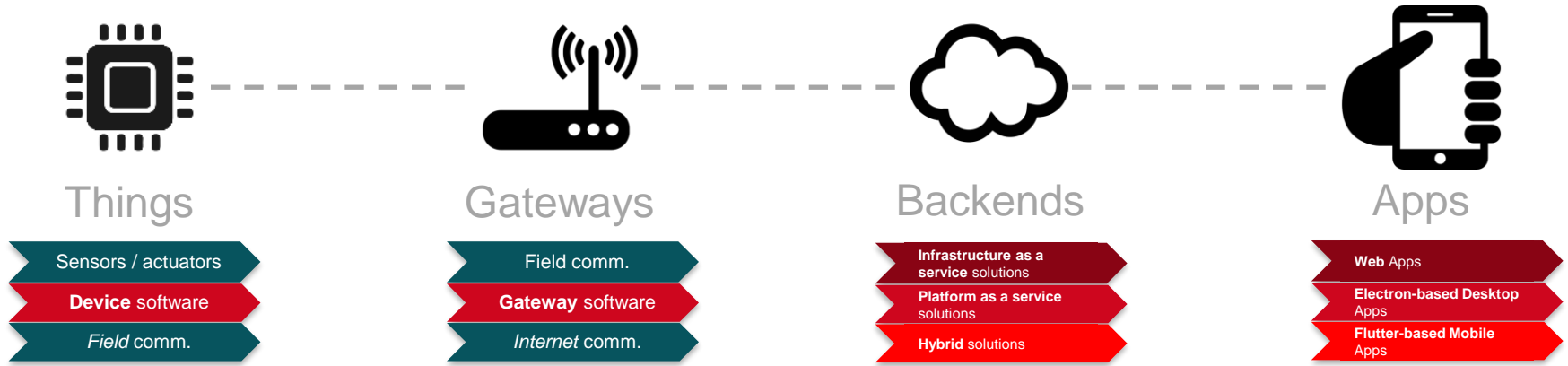
HIGHLY SPECIALIZED UNITS COLLABORATING AS ONE LIVING NETWORK



CONCEPT REPLY

The Reply Group expert pool for the Internet of Things (IoT).

BUILDING END-2-END SOLUTIONS



„Be a competent partner for the **entire software stack** of your IoT projects“



OUR CUSTOMERS



KEY TAKEAWAYS

Invest time in identifying all edge cases in the update process to avoid bricked devices.

Security, security, security, ...



QUESTIONS?

