A Fully Integrated Solution to Update Your IoT Devices
Why FullMetalUpdate?
A couple of hours later - Containers

Container
- Application
- Network
- QT 5.8

Container
- MQTT
- Network
- Touch Screen
- GPU
- Network
A couple of hours later - CGroups

Fine-grained control over allocating, prioritizing, denying and managing system resources
A couple of hours later - Security

- Secomp limit access to system calls
- Rootless containers
- Mandatory Access Control Policy
Early morning

**Power Failure:** Delta updates are based on Overlayfs, AuFS, ... which are not power failure resistant.

**Complexity:** Docker comes with multiple layers to manage containers life cycles, updates, ... which are not needed for embedded devices.
Late morning...

Does it exist???

Dual partition
Host Linux

Git
Librsync

docker
docker
What do we need?

1. Runtime to run containers
2. Build system to create containers
3. Delta updates
4. Backend to manage the different updates
5. Client to download update
6. Tool to manage containers life cycle
Step 1 - Open Container Initiative

A Runtime Specification which outlines how to run a “filesystem bundle” that is unpacked on disk.

Multiple implementations:

- RunC
- Clear Containers
- RailCar
Step 2 - Create containers

- Need a replacement for dockerfiles
- Should work for ARM, X86, ... architectures
- A tool to pull only needed dependencies
- Build system itself in a Docker container

Optimize for your processor!
Step 3 – OsTree for delta updates

Used by:

- Git for binaries
- Fully atomic updates
- Only update delta
- Used to update containers and the OS
- Everything happens in the background
Step 3 - Delta updates and containers

Local Server

OSTree server
Delta Updates

Build farm

Container
App – V1

OSTree client
Delta Updates

Embedded system

Container
App – V1

OS – V1
Step 4 - Update server

- Hawkbit as a backend and frontend
- Fully integrated with the Yocto build system
Step 4 - Cloud agnostic

- Easy to setup with Docker Compose
Step 5 & 6 - Client

- Based on Rauc Hawbit client
- Integration with OsTree
- SystemD to manage containers life cycles
Overview

OSTree Server

Hawkbit
Maria DB

FMU Client
System D
OS – V1

Container

App – V1

OSTree client

Cloud

Embedded systems

Local Server

OSTree local Delta Updates

OS – V1

Build farm

yocto project
Security?

Communication Attacks:
- Man in The Middle
- Code vulnerabilities
- ...

Software Attacks:
- Buffer overflows
- Malware
- ...

HW Attacks:
- JTAG
- Bus, IO pins
- ...

Cost/Effort To Attack vs. Cost/Effort to Secure
What’s available?
fullmetalupdate-cloud-demo

Docker containers started with docker-compose:
- Start an Hawkbit server instance (with MariaDB)
- Start an OsTree instance
Docker container to automate the build process:
- Select the Machine and the Yocto version to Sync
- Build the OS image: StartBuild.sh fullmetalupdate-os
- Build the Containers: StartBuild.sh build-container container-evcs
- Start a bash shell: StartBuild.sh bash
meta-fullmetalupdate

Includes everything which is not specific to a machine:
- Container framework recipe
- FullMetalUpdate Python client and dependencies
- BB classes to push containers and OS images to OsTree and Hawkbit
meta-fullmetalupdate-extra

Includes everything which is specific to a machine
- GPU stuff
- Dynamic layers per machine
- Containers recipes
- Image creation scripts
Tensorflow lite in a container

- Add a new container to an IoT device
- Run this container and realize an image classification task
- Measure the performance of the classification model
QT in a container

Update your QT application seamlessly

First version

Add multiple languages

Add credit card support
Roadmap

- Port to STM32MP1
- Port to i.MX8
- Final Integration with Skopeo
- Integration with Container Network Interface
- Port to Warrior and Sumo
CONCLUSION
FullMetalUpdate

- Available on GitHub:
  https://github.com/FullMetalUpdate

- Documentation:
  https://www.fullmetalupdate.io/docs/documentation/

- Do you want to contribute?
  https://www.fullmetalupdate.io/docs/contribute/
Questions
Accountability & Commitment
Cutting Edge expertise
Agility & Scalability  Reliability
Local Teams  Worldwide presence
Global Actions
Compliance with customers teams

Thank you

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