Zephyr® Project
Developer Summit

ThingSet + Zephyr: Transport-Agnostic Device Connectivity Within 10 Minutes

Martin Jäger - Libre Solar

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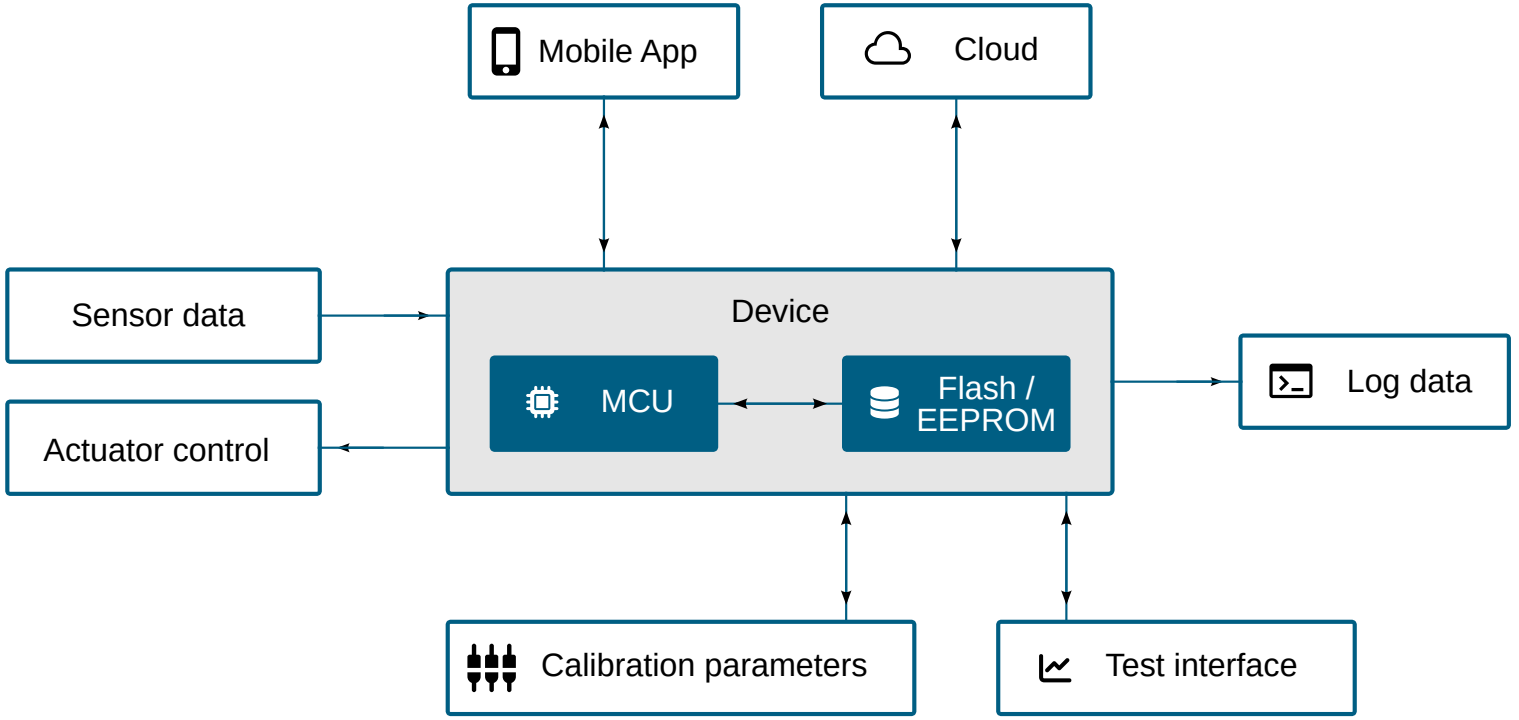
#EMBEDDEDOSSUMMIT

Data Flows in Embedded Devices

ThingSet



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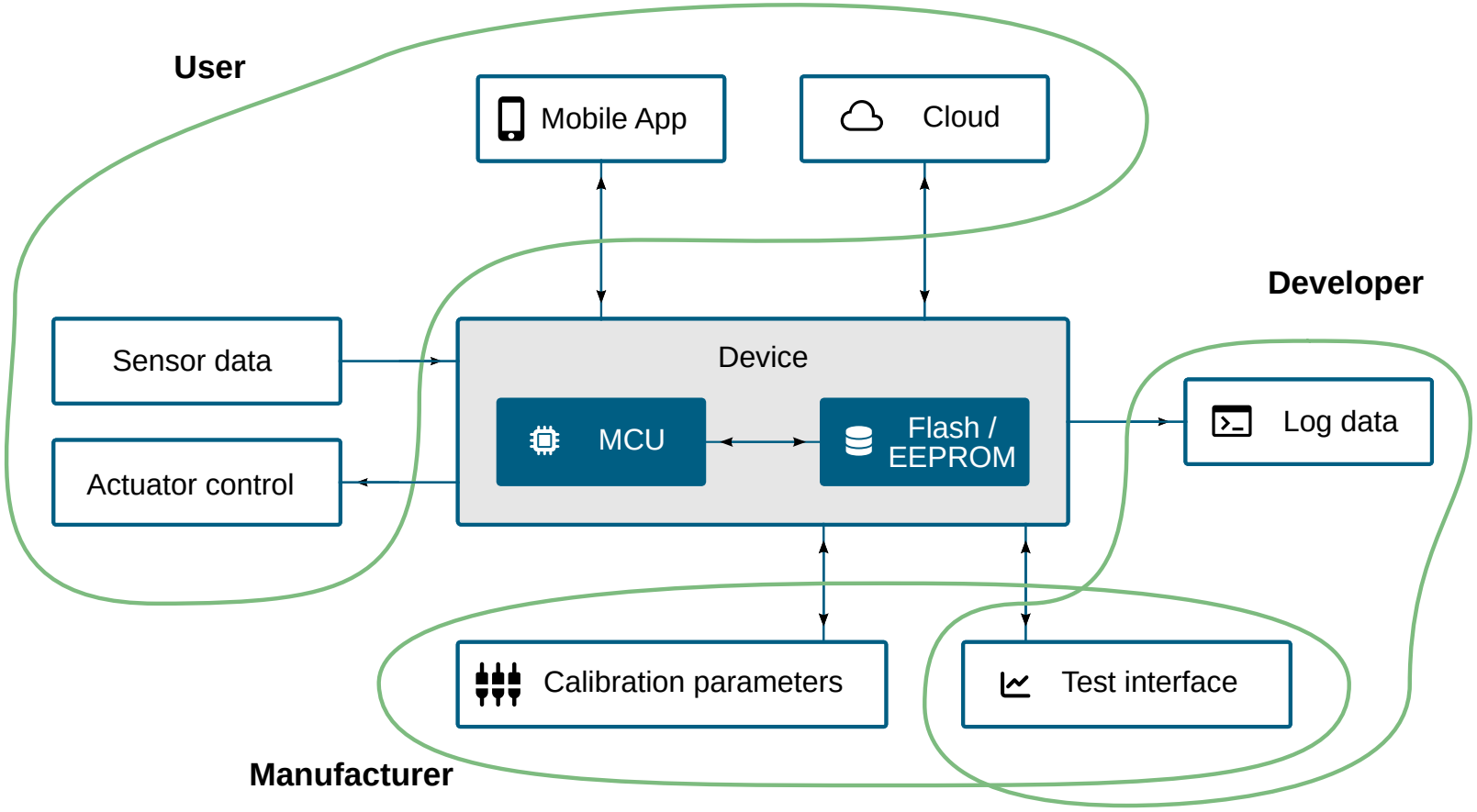


Agenda

ThingSet

1. Semantic Data Model
2. ThingSet Protocol
3. Transports & Mappings
4. Zephyr Integration
5. Demo Time!
6. Roadmap and Outlook

Example Application

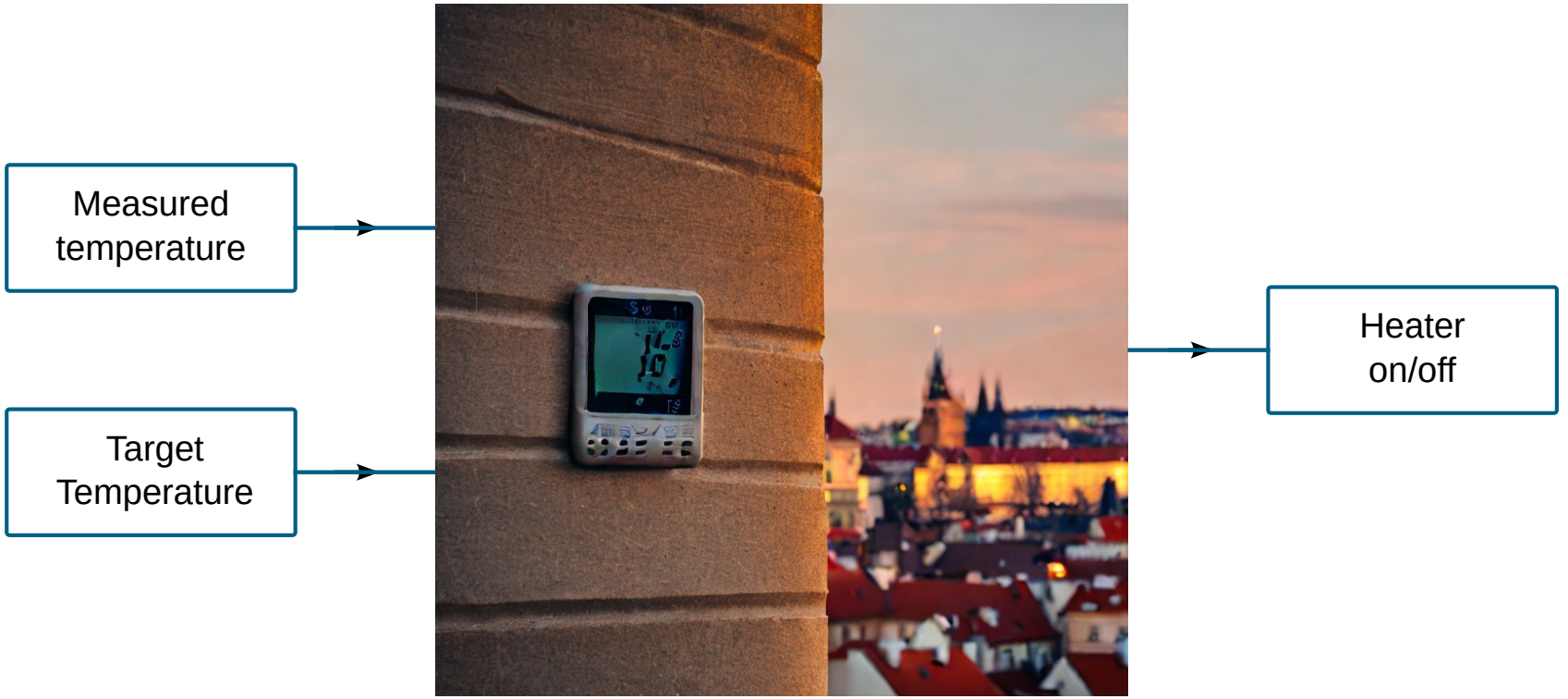
ThingSet

"A thermostat in Prague at sunset"

by Stable Diffusion

Example Application

ThingSet



"A thermostat in Prague at sunset"

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Semantic Data Model

ThingSet

```
{
    "pNodeID": "C001CAFE01234567",     # data item
    "pNodeName": "Smart Thermostat",
    "Sensor": {                        # group
        "rRoomTemp_degC": 18.3,
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    },
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Main Objectives

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Schema-less and self-explanatory: All essential information can be retrieved from the device itself.

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Main Objectives

Schema-less and self-explanatory: All essential information can be retrieved from the device itself.

Easy to use and human-readable (JSON in text mode).

Compact footprint (CBOR and numeric IDs in binary mode).

Data Object Prefixes

ThingSet

Data Items

Prefix	Description
`c`	constant item
`r`	read-only item
`w`	write-able item
`s`	stored item
`p`	protected item
`t`	timestamp
`x`	executable item

Subsets

Prefix	Description
`a`	attribute subset
`e`	event subset
`m`	metrics subset

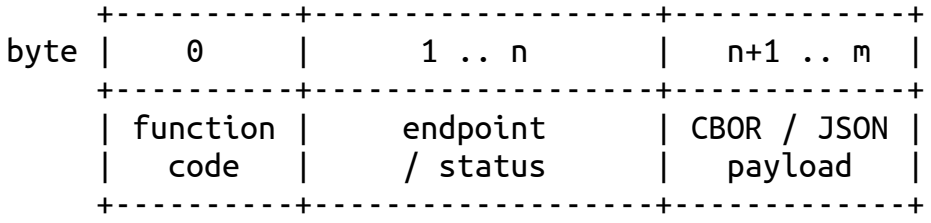
Groups and Overlays

No prefix, starting with upper-case letter.

Access Protocol

ThingSet

Message layout



Report/Desire function codes

Text	Binary	Description
@	0x1D	Desire
#	0x1F	Report

Request/Response function codes

Text	Binary	Description
?	0x01 / 0x05	GET / FETCH
=	0x07	UPDATE
+	0x06	CREATE
-	0x04	DELETE
!	0x02	EXEC
:	0x80 - 0xFF	Response + code

Request/Response Examples

ThingSet

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        }
    }
}
```

GET all `Sensor` values:

```
?Sensor

:85 {"rRoomTemp_degC":18.3,"rHumidity_pct":60.2}
```

UPDATE target temperature:

```
=Control {"sTargetTemp_degC":20}

:84
```

DELETE humidity sensor from live metrics subset:

```
-mLive "Sensor/rHumidity_pct"

:82
```

Report/Desire Examples

ThingSet

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        }
    }
}
```

Report of `Sensor` group:

```
#Sensor {"rRoomTemp_degC":18.3,"rHumidity_pct":
60.2}
```

Report of live metrics subset:

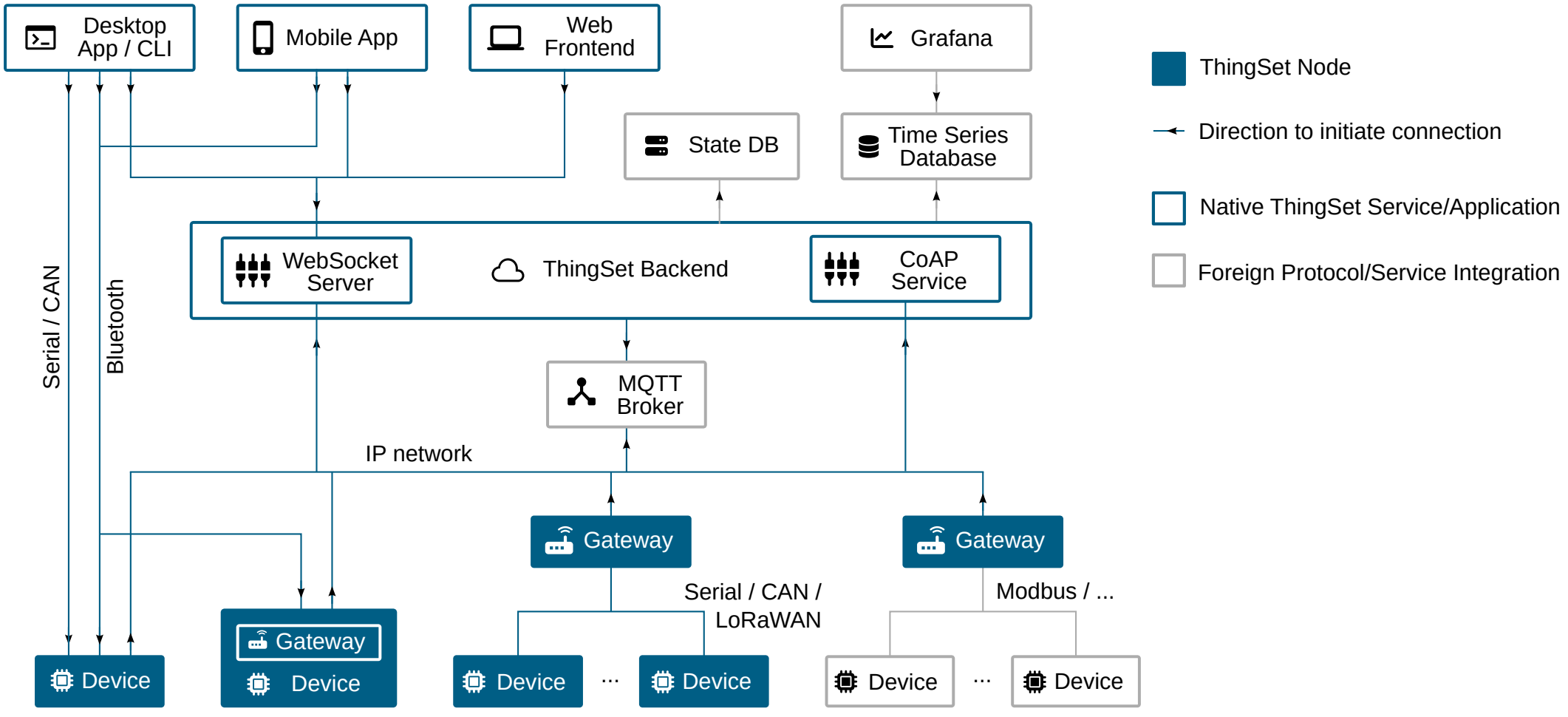
```
#mLive {"Sensor":{"rRoomTemp_degC":18.3,"rHumidity_
pct":60.2},"Control":{"rHeaterOn":true}}
```

Desire to change target temperature:

```
@Control {"sTargetTemp_degC":20}
```

Network Topology

ThingSet



Transports & Mappings

ThingSet

Transports

Message-oriented, bi-directional and reliable communication channels to exchange ThingSet messages transparently.

- WebSocket
- CAN (with ISO-TP)
- Serial (with optional CRC)
- Bluetooth LE (with packetization)
- SMS

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Mappings

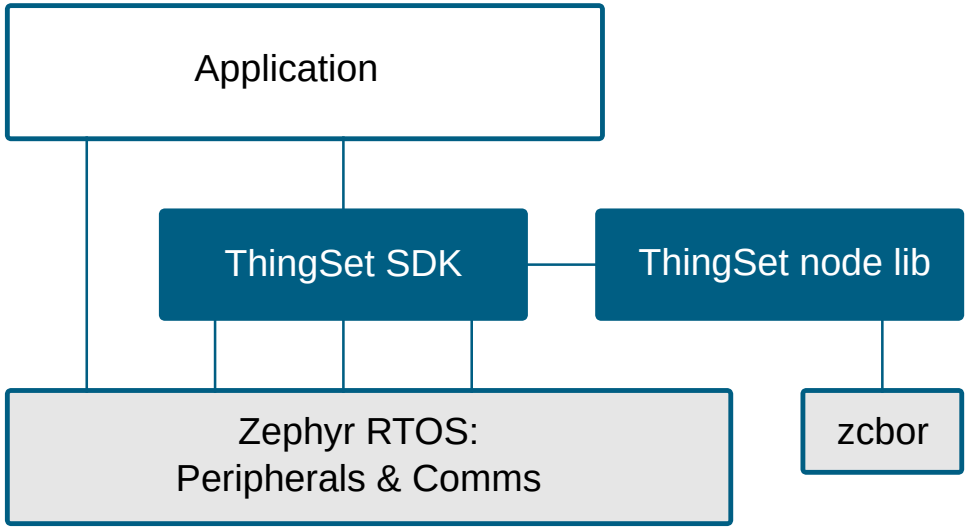
ThingSet messages are translated into the native format required by the protocol. Not all features of ThingSet may be supported.

- MQTT
- LoRaWAN
- CoAP

Zephyr Integration

ThingSet

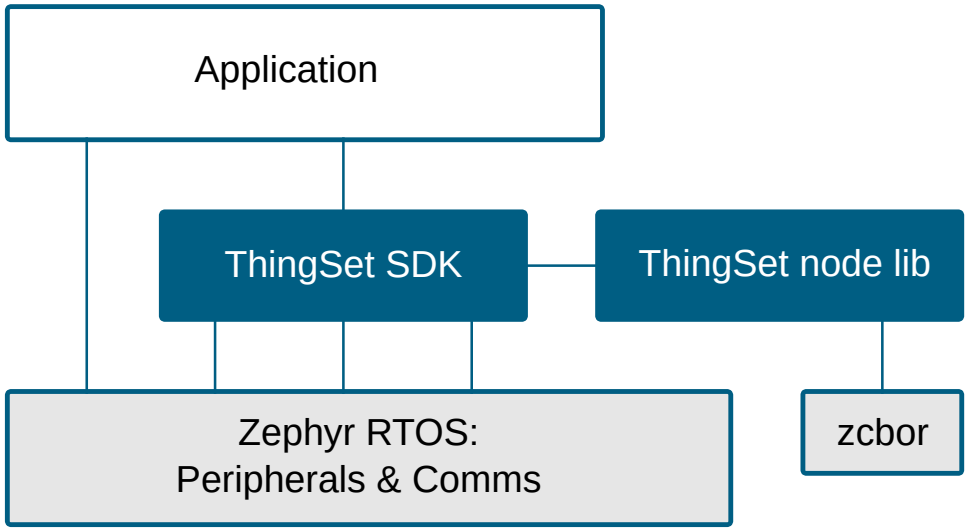
Firmware Modules



Zephyr Integration

ThingSet

Firmware Modules

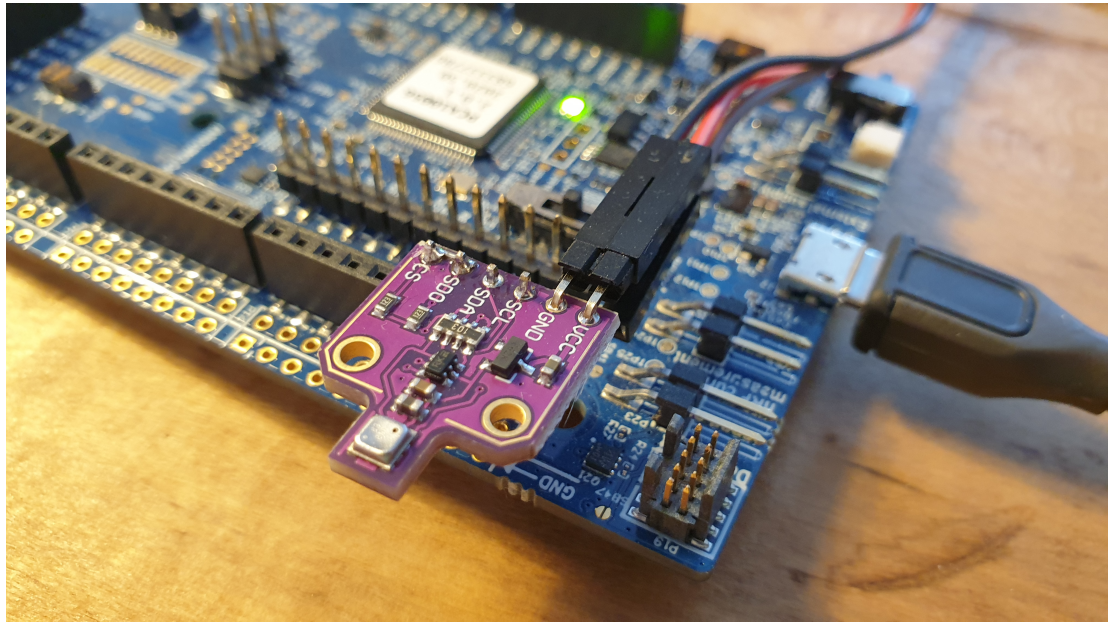


Used Zephyr features

- Iterable Sections
- Work queues
- Peripheral drivers
  - UART / USB serial
  - CAN & ISO-TP
- Bluetooth
- Shell subsystem
- Custom logger backend
- ...

Demo Time!

ThingSet



- Zephyr RTOS v3.4
- Nordic nRF52840 DK
- Bosch BME680 Sensor
- ThingSet App (Flutter)

Summary

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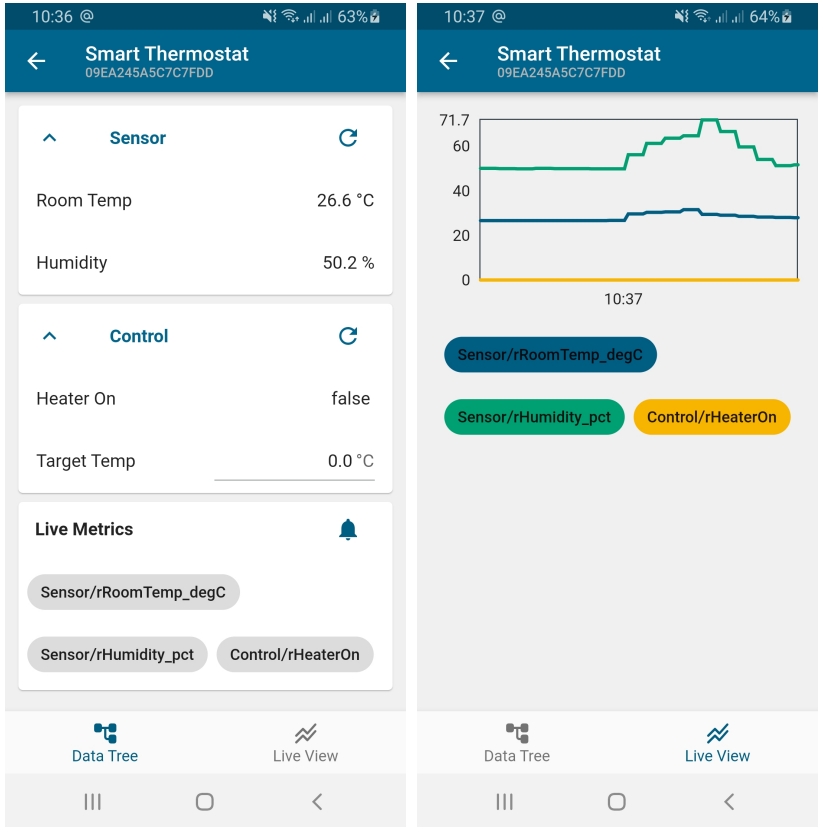
Data Model + ThingSet Zephyr SDK =



Roadmap and Outlook

ThingSet

1. Release v1.0 spec till end of 2023

Roadmap and Outlook

ThingSet

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2. Grow a community around ThingSet

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3. Improve ThingSet SDK and app features

Roadmap and Outlook

ThingSet

1. Release v1.0 spec till end of 2023
2. Grow a community around ThingSet
3. Improve ThingSet SDK and app features
4. Support for other programming languages

Zephyr® Project
Developer Summit

Contact

Martin Jäger | martin@libre.solar | LinkedIn

Resources

Libre Solar: libre.solar | github.com/LibreSolar

ThingSet: thingset.io | github.com/ThingSet