

# ARTIK Gateway Modules

Wei Xiao

June 2, 2018

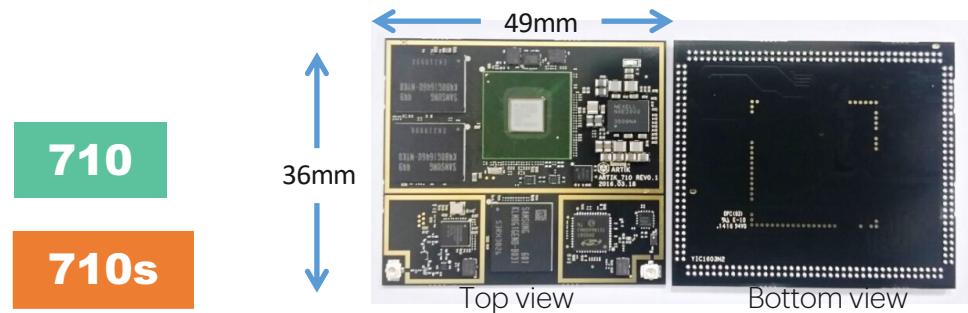
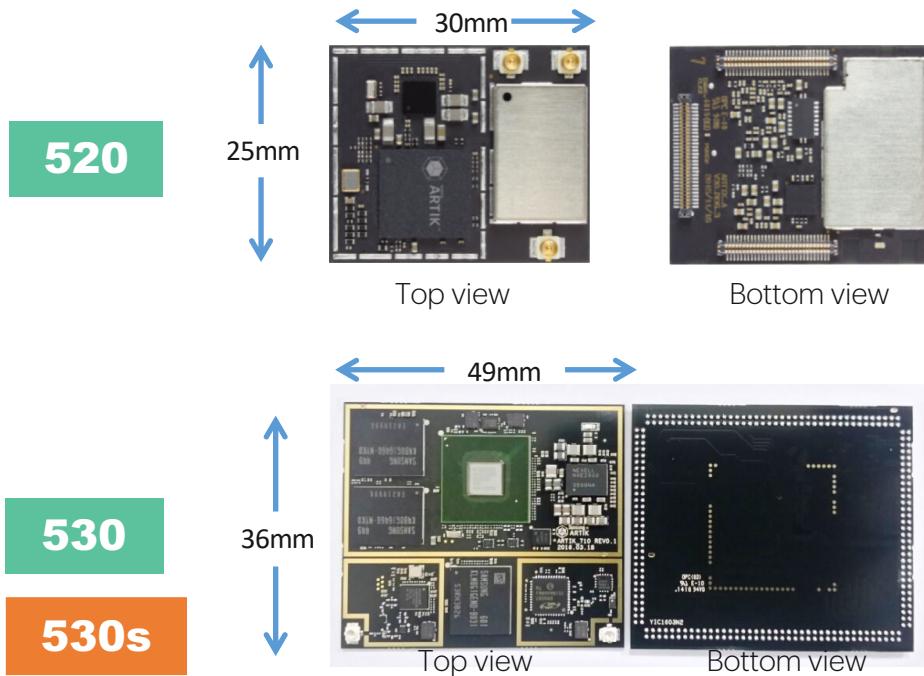


# Agenda

- ARTIK Gateway Module Overview
- ARTIK Gateway Module Software Stack
- ARTIK End-to-end Solution
- ARTIK Gateway Module Development
- ARTIK Gateway Module Ecosystem

# ARTIK Gateway Module Overview

# ARTIK High-end module



# Samsung ARTIK™ 530/530s (512 MB, 1 GB) mid-range gateway

## Secure, fully-integrated IoT solution



- Industrial and home gateways
- Voice-controlled speakers
- Building zone controllers
- Display-based healthcare monitors



<b>Processor</b>	CPU: 4x ARM® Cortex® A9 @ 1.2 GHz GPU: 3D graphics accelerator
<b>Memory</b>	DRAM: 512 MB/1 GB DDR3 Flash: 4 GB eMMC v4.5
<b>Multimedia</b>	Camera I/F: 4-lane MIPI CSI up to 5MP Display: 4-lane MIPI DSI, HDMI 1.4 a or LVDS (1280 x 720 @ 60 fps) Audio: 2x I2S audio input/output
<b>Connectivity</b>	WLAN (Wi-Fi): IEEE 802.11 b/g/n single-band SISO Bluetooth: 4.2+ Smart 802.15.4: Zigbee, Thread Ethernet: 10/100/1000 Base-T MAC (external PHY required)
<b>Security</b>	Secure element, EAL Level 5, unique device certificate and keys, PKI with mutual authentication to cloud, hardware crypto engine; secure boot*, KMS*, TEE*, *S-modules
<b>I/O</b>	GPIO, UART, I2C, SPI, USB Host, USB OTG, HSIC, ADC, PWM, I2S, JTAG
<b>Temperature range</b>	-25° to 85° (°C)
<b>Size</b>	36 mm W x 49 mm H x 3.4 mm D

# Samsung ARTIK™ 710/710s high-end gateway

## Secure, fully-integrated IoT solution

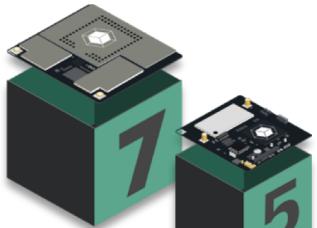
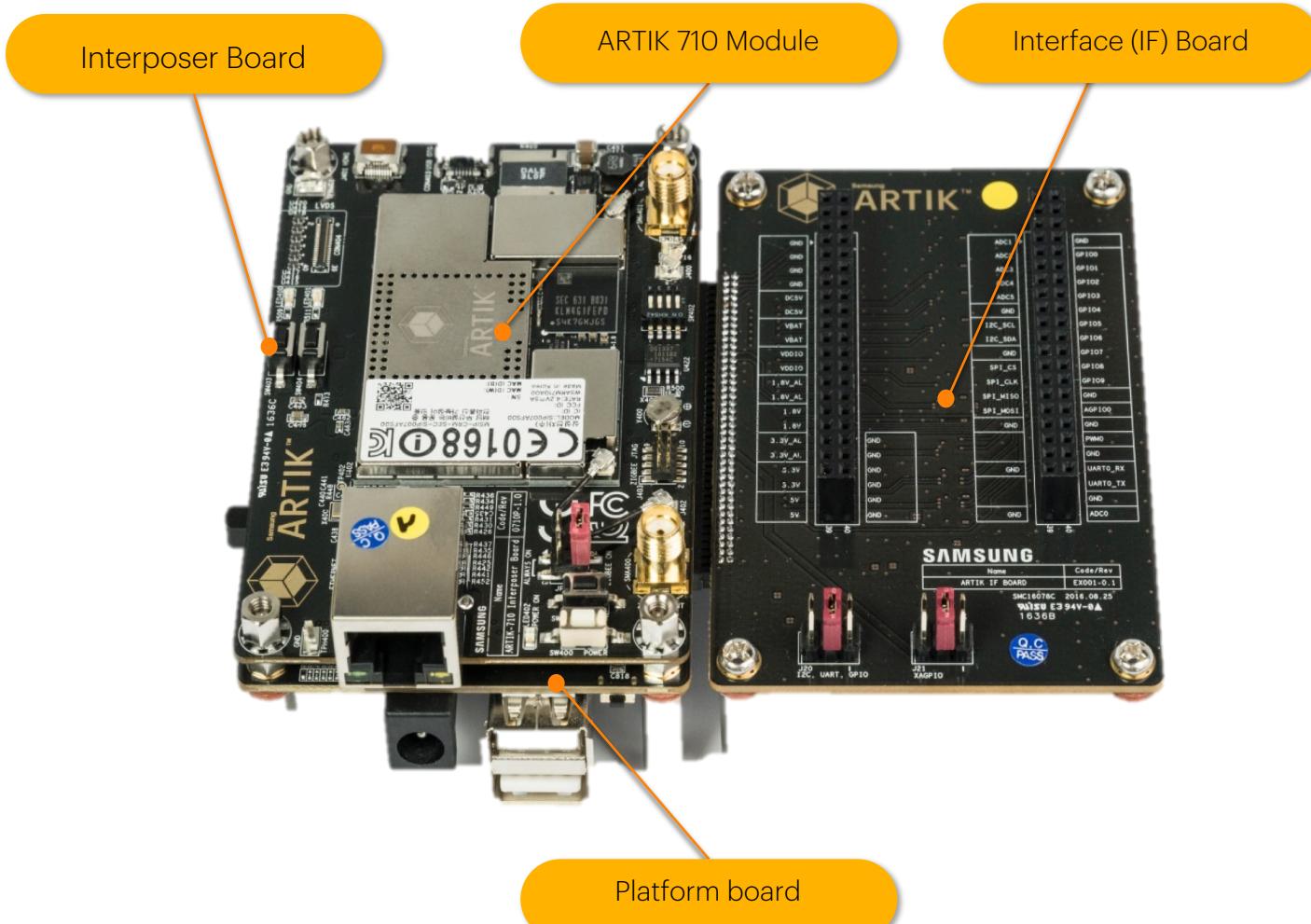


- High-end gateways
- Cameras
- Human-machine interface
- Machine learning

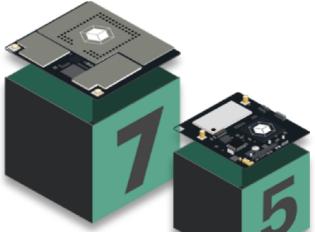
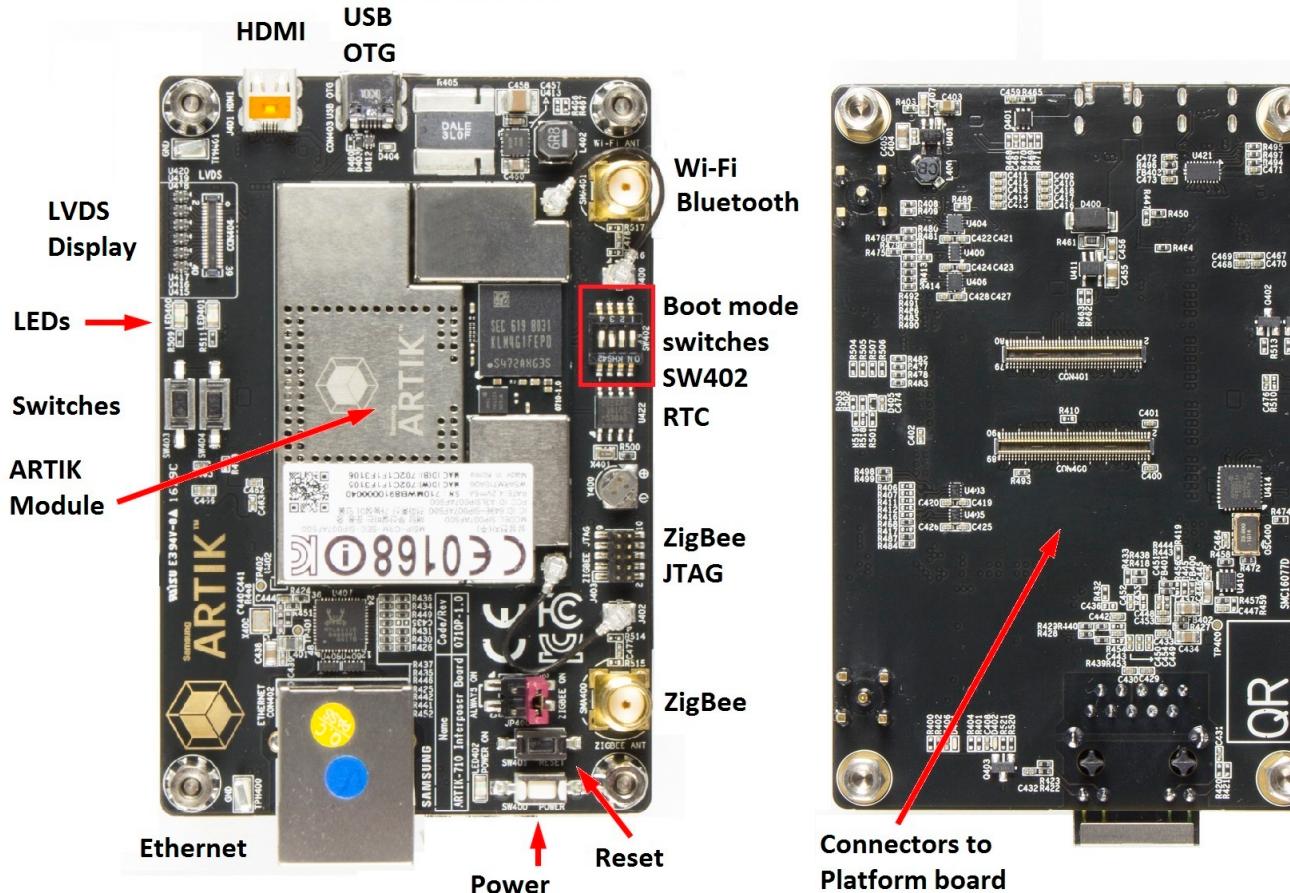


<b>Processor</b>	CPU: 8x ARM® Cortex® A53 @ 1.4 GHz GPU: 3D graphics accelerator
<b>Memory</b>	DRAM: 1 GB DDR3 @ 800 MHz Flash: 4 GB eMMC v4.5
<b>Multimedia</b>	Camera I/F: 4-lane MIPI CSI Display: 4-lane MIPI DSI up to FHD@24 bpp, LVDS, HDMI v1.4 Audio: I²S audio interface
<b>Connectivity</b>	WLAN (Wi-Fi): IEEE 802.11 b/g/n/ac Bluetooth: 4.1+ Smart 802.15.4: Zigbee, Thread Ethernet: 10/100/1000 Base-T MAC (external PHY required)
<b>Security</b>	Secure element, EAL Level 5, unique device certificate and keys, PKI with mutual authentication to cloud, hardware crypto engine; secure boot*, KMS*, TEE*, *S-modules
<b>I/O</b>	GPIO, I²C, I²S, SPI, UART, PWM, SDIO, USB 2.0, JTAG, analog input
<b>Temperature range</b>	0° to 70° (°C)
<b>Size</b>	36 mm W x 49 mm H x 3.4 mm D

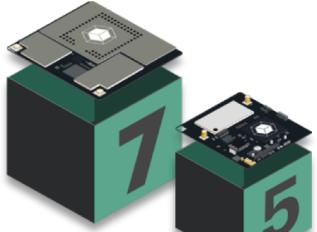
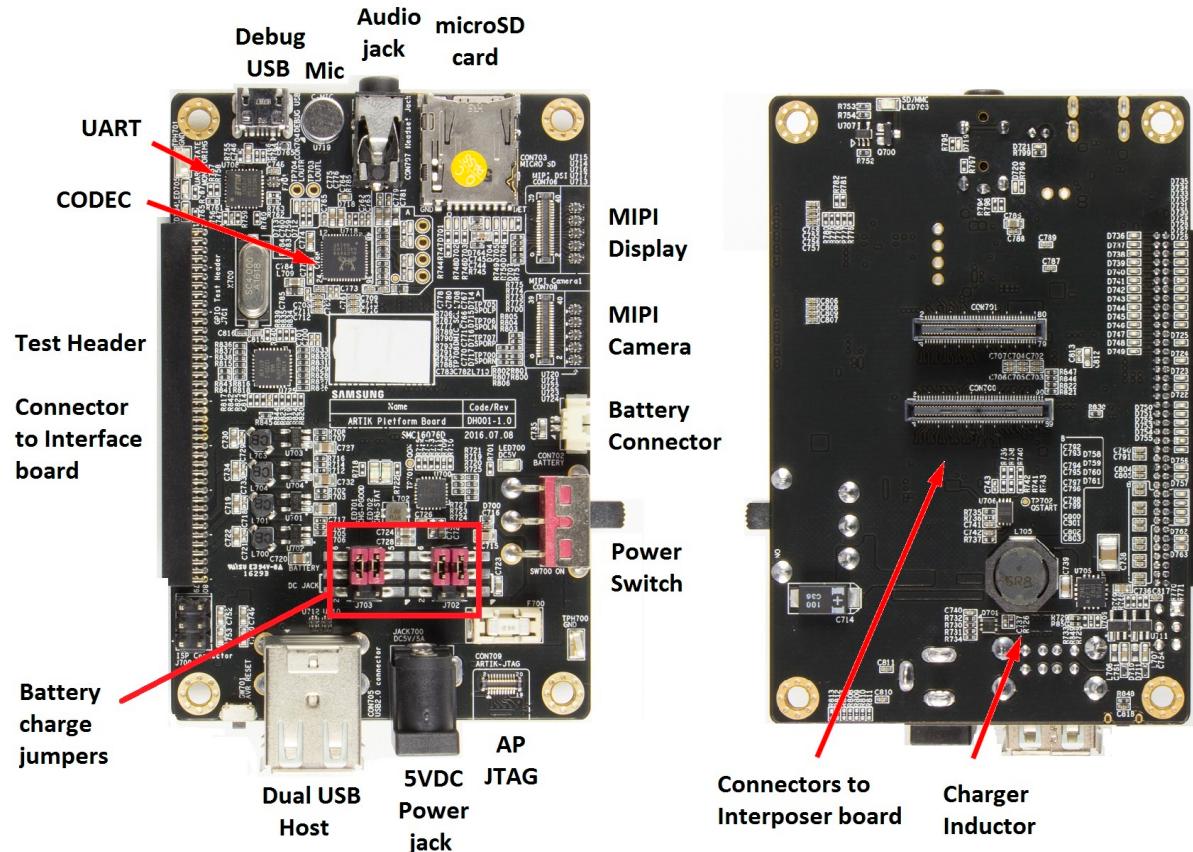
# ARTIK High-end module development board



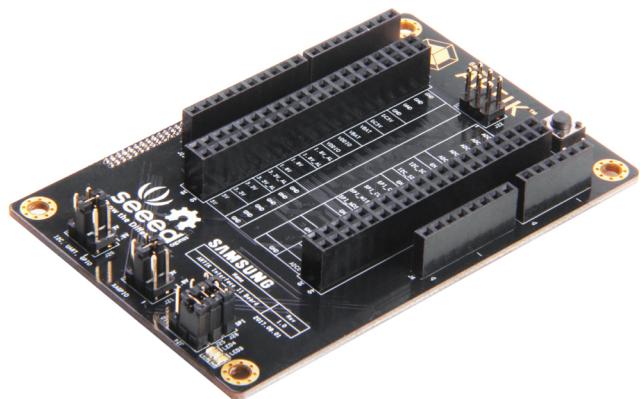
# ARTIK High-End Module Interposer Board



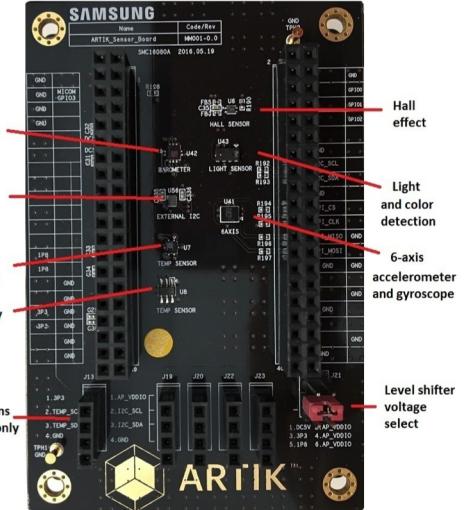
# ARTIK Gateway Module Platform Board



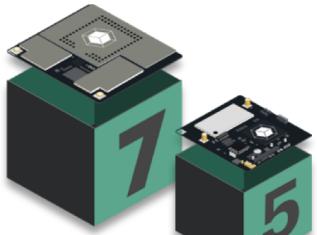
# ARTIK Gateway Module Expansion Boards



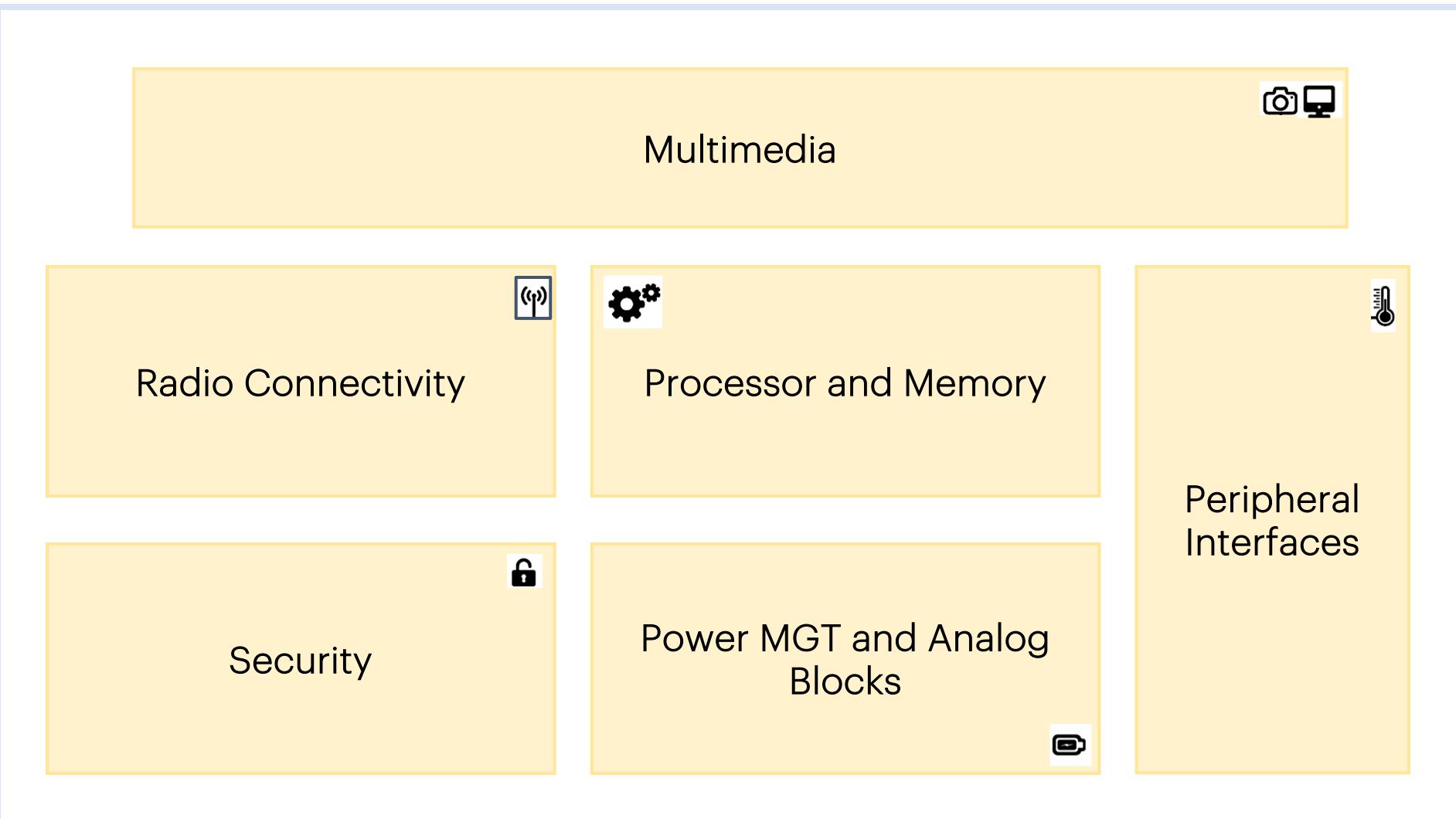
Interface Board II



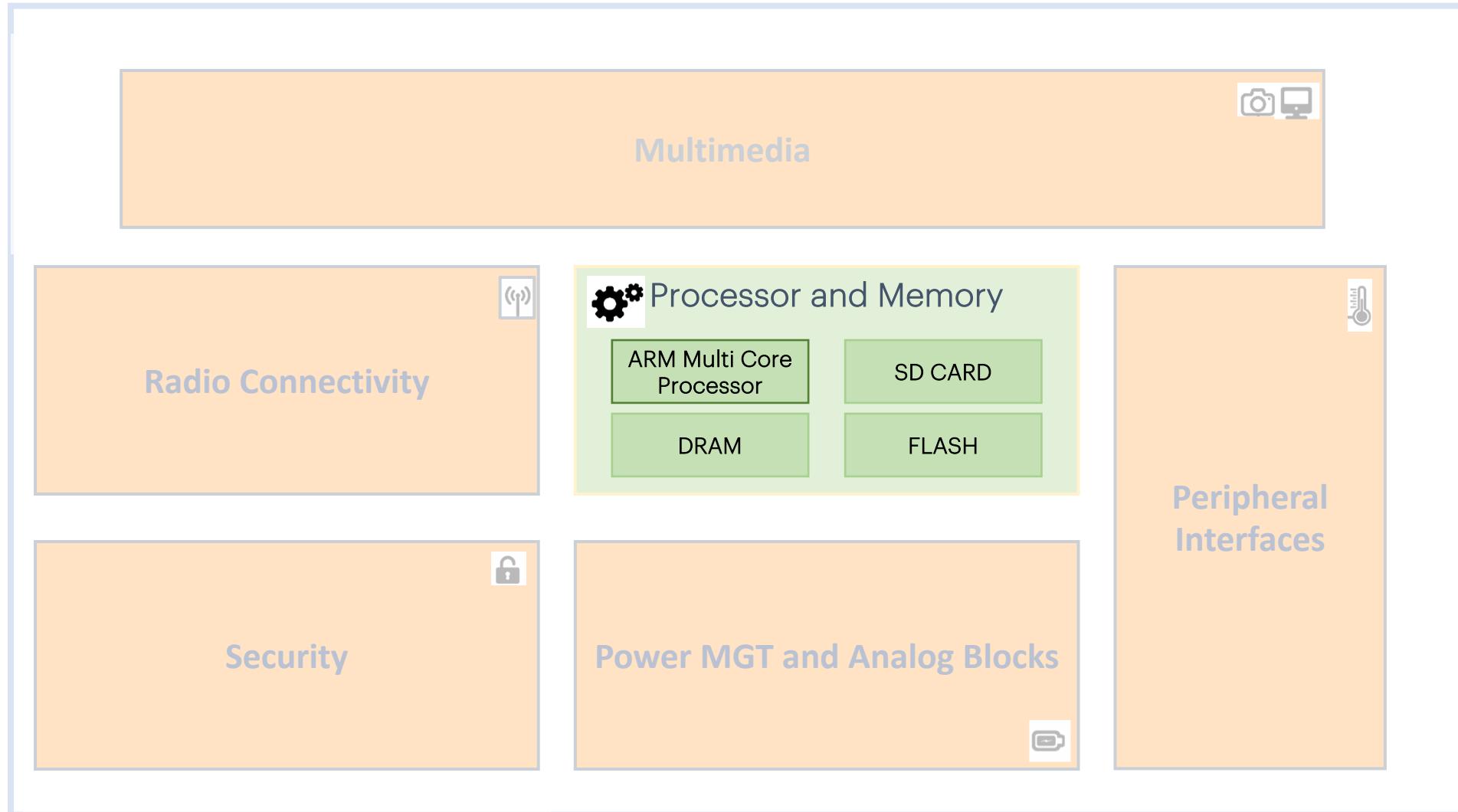
Sensor Board



# Product Details



# Product Details – Processor and Memory



# Radio Connectivity

Radio	Data Rate	520	530	710
BLE	<1Mbps	✓	✓	✓
BT	1-3Mbps	✓	✓	✓
ZigBee	10-100Kbps	✓	✓	✓
Thread	10-100Kbps	✓	✓	✓
Wi-Fi	10-100Mbps	✓	✓	✓
Ethernet		✓	✓	✓

\*Z-wave and Sigfox chip set is on 520 development boards

# Radio Protocol Comparsion

Range

Long

Short

Low

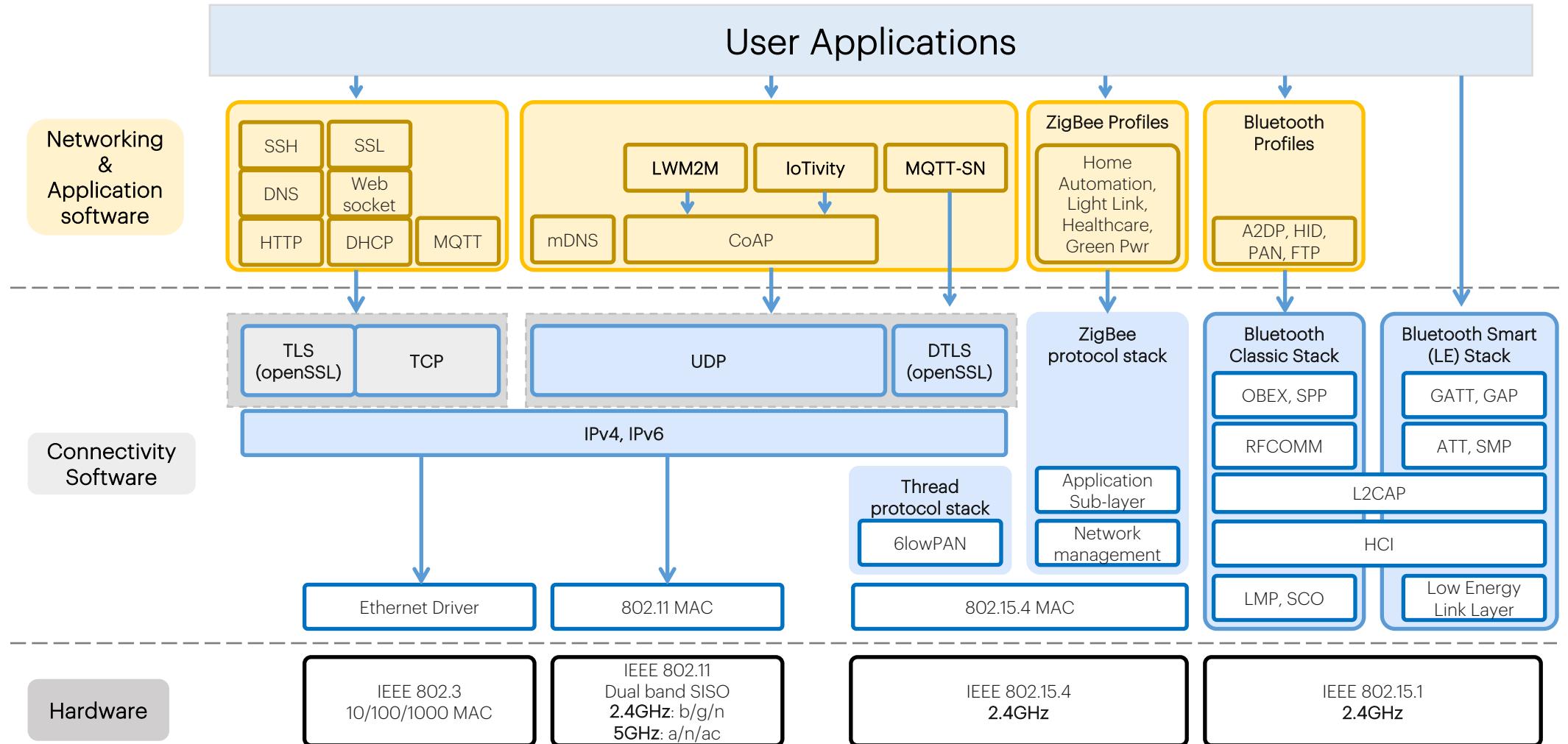
Medium

High

Bandwidth



# Network Stack



# Peripheral Interfaces + Power MGT & Analog blocks

	<b>520</b>	<b>530</b>	<b>710</b>
Peripheral Interfaces	I2C	6	3
	SPI	2	2
	GPIO	100	107
	UART	2	3
	USB	USB 2.0*	USB 2.0
Analog and Power MGT	ADC	2	6
	PWM	2	2
	PMIC	✓	✓

\*USB device mode only for 520, rest of the module is both device and host mode.

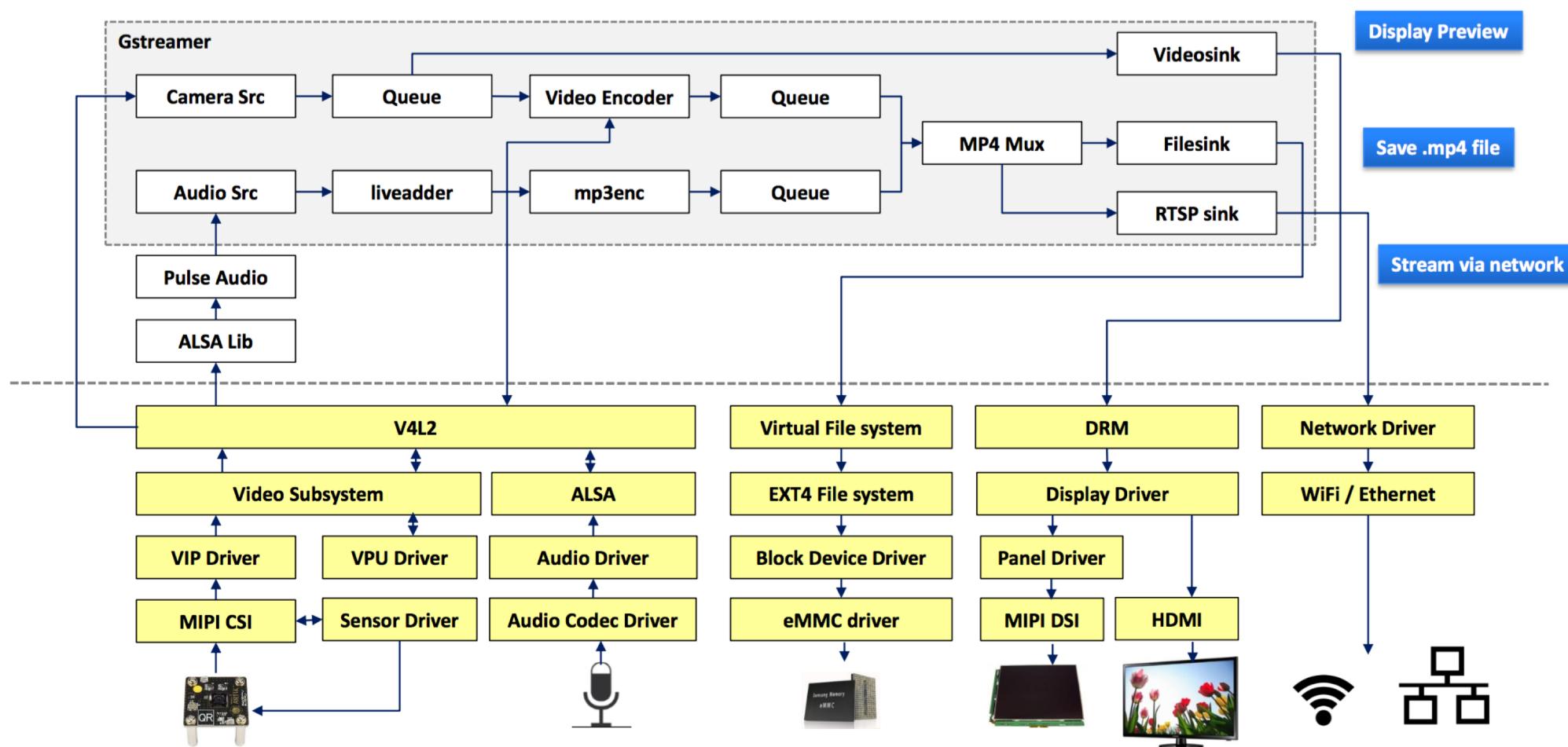
# Product Details - Multimedia

	<b>520</b>	<b>530</b>	<b>710</b>
I2S	1x	2x	2x
HDMI	n/a	1080p @ 60fps	1080p @ 60fps
MIPI – DSI	2-lane 540p @ 24bpp	4-lane 1080p @ 60fps	4-lane 1200p @ 24bpp
MIPI – CSI	2-lane 3MP @ 30fps	4-lane 1080p @ 30fps	4-lane 1080p @ 30fps
LVDS	n/a	720p @ 60fps	720p @ 60fps

# Product Details - Multimedia

	<b>520</b>	<b>530</b>	<b>710</b>
I2S	1x	2x	2x
HDMI	n/a	1080p @ 60fps	1080p @ 60fps
MIPI – DSI	2-lane 540p @ 24bpp	4-lane 1080p @ 60fps	4-lane 1200p @ 24bpp
MIPI – CSI	2-lane 3MP @ 30fps	4-lane 1080p @ 30fps	4-lane 1080p @ 30fps
LVDS	n/a	720p @ 60fps	720p @ 60fps

# ARTIK Multimedia Framework



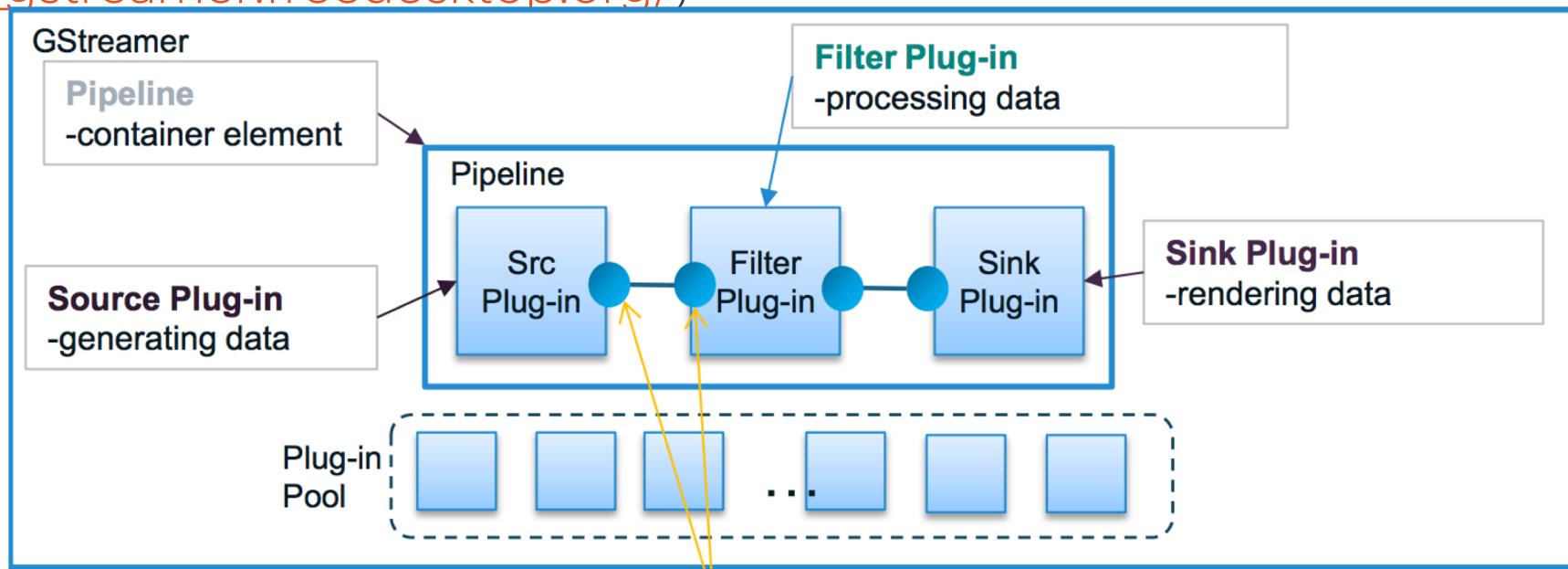
# V4L2

## Video for Linux Version 2 (V4L2)

- A collection of device drivers and API for supporting real-time video capture on Linux systems
- Supports many USB webcams, TV tuners, and related devices, standardizing their output

# GStreamer

- Pipeline-based multimedia framework that links together a wide variety of media processing system to complete complex workflows  
(<https://gstreamer.freedesktop.org/>)

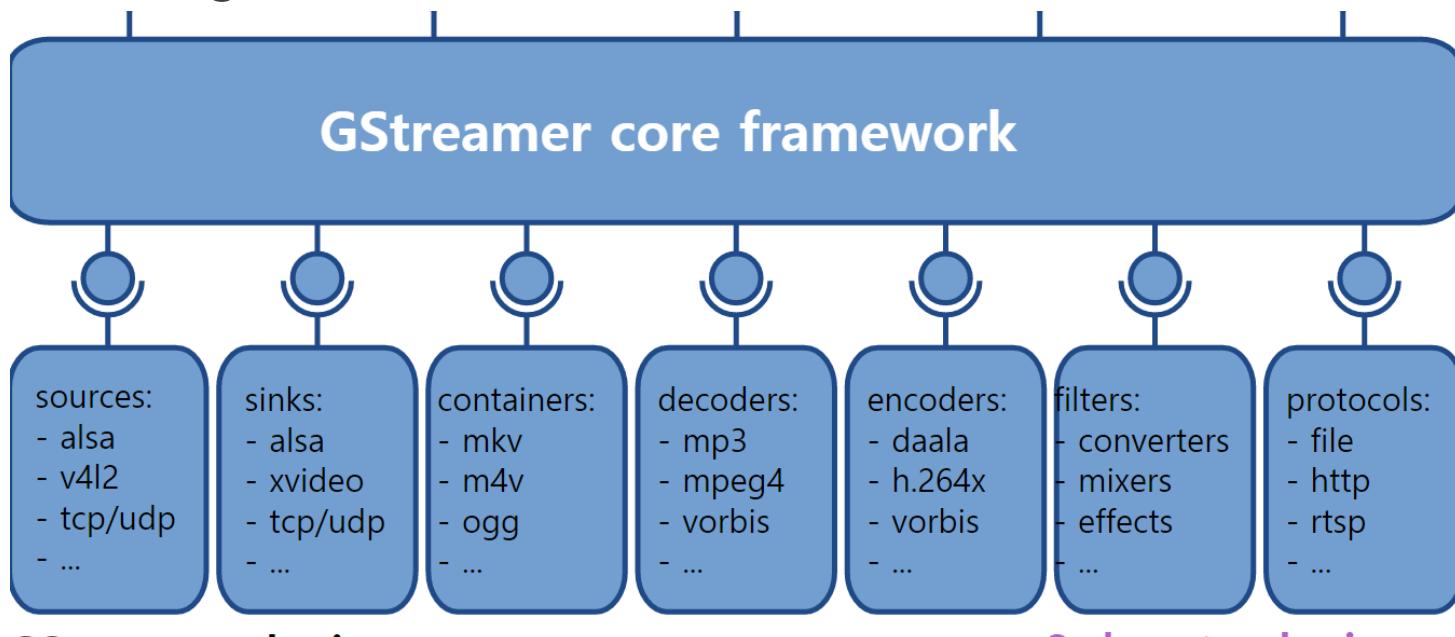


# GStreamer

- Supports a wide variety of media handling components
  - Simple audio playback
  - Audio and video playback
  - Recording
  - Streaming and editing
- Serves as a base to create many types of multimedia application such as video editors, transcoders, streaming media broadcaster, media player

# GStreamer Plugins

- GStreamer uses a plug-in architecture which makes the most of Gstreamer's functionality implemented as shared libraries.
- Various types including source, sinks, filters, etc.



## GStreamer plugins

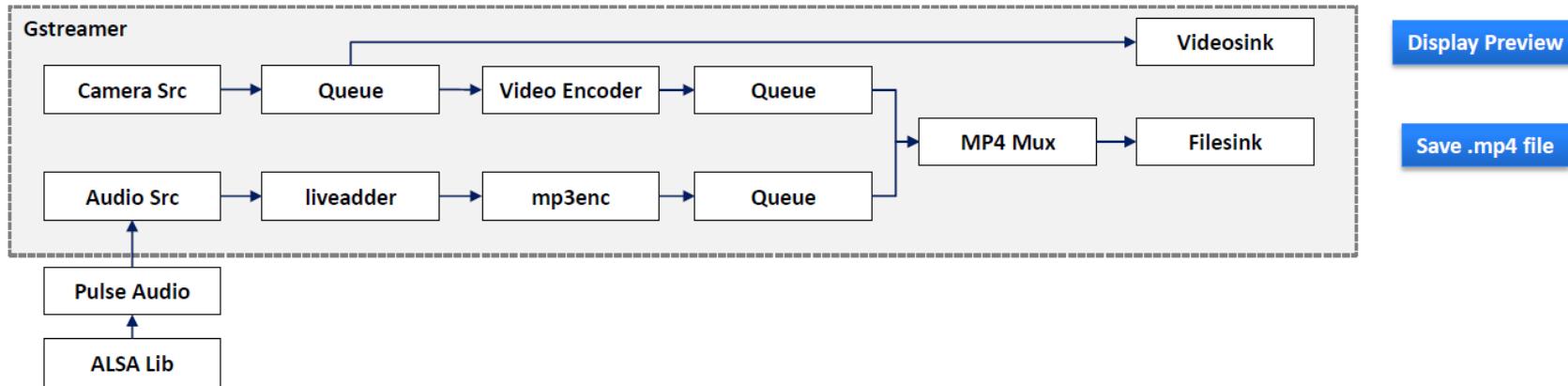
GStreamer includes over 150 plugins  
software plugins are executed on the host CPU  
hw accelerated plugins shunt execution to acceleration DSPs and the result back

## 3rd party plugins

Texas Instruments, Motorola,  
et al.

# GStreamer Pipeline Example for ARTIK710/530

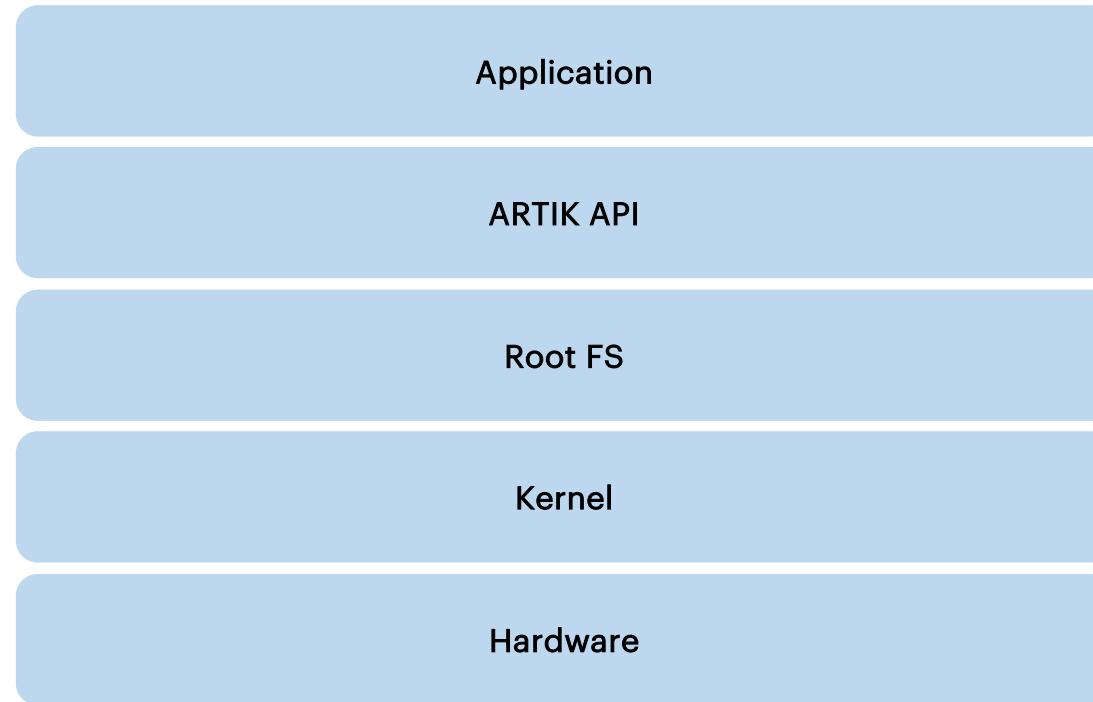
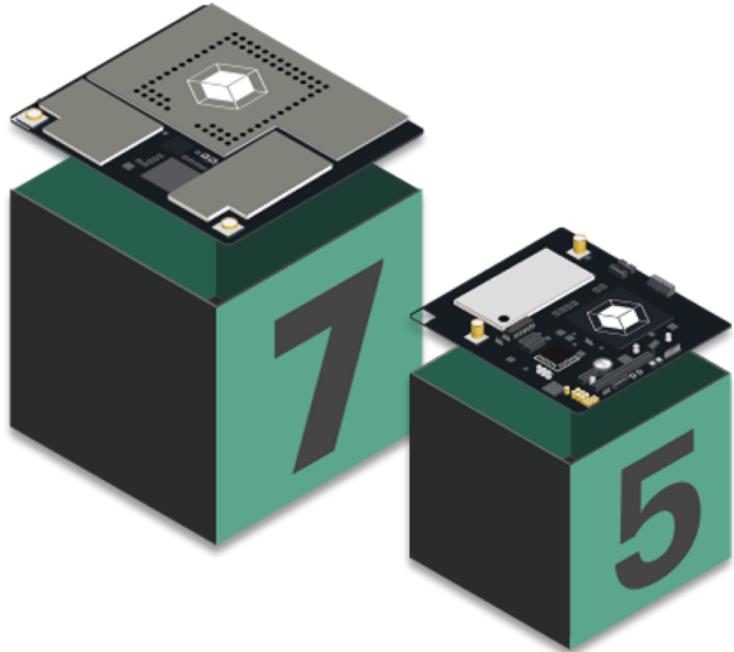
- Record a HD MP4 movie with sound and simultaneous preview on display



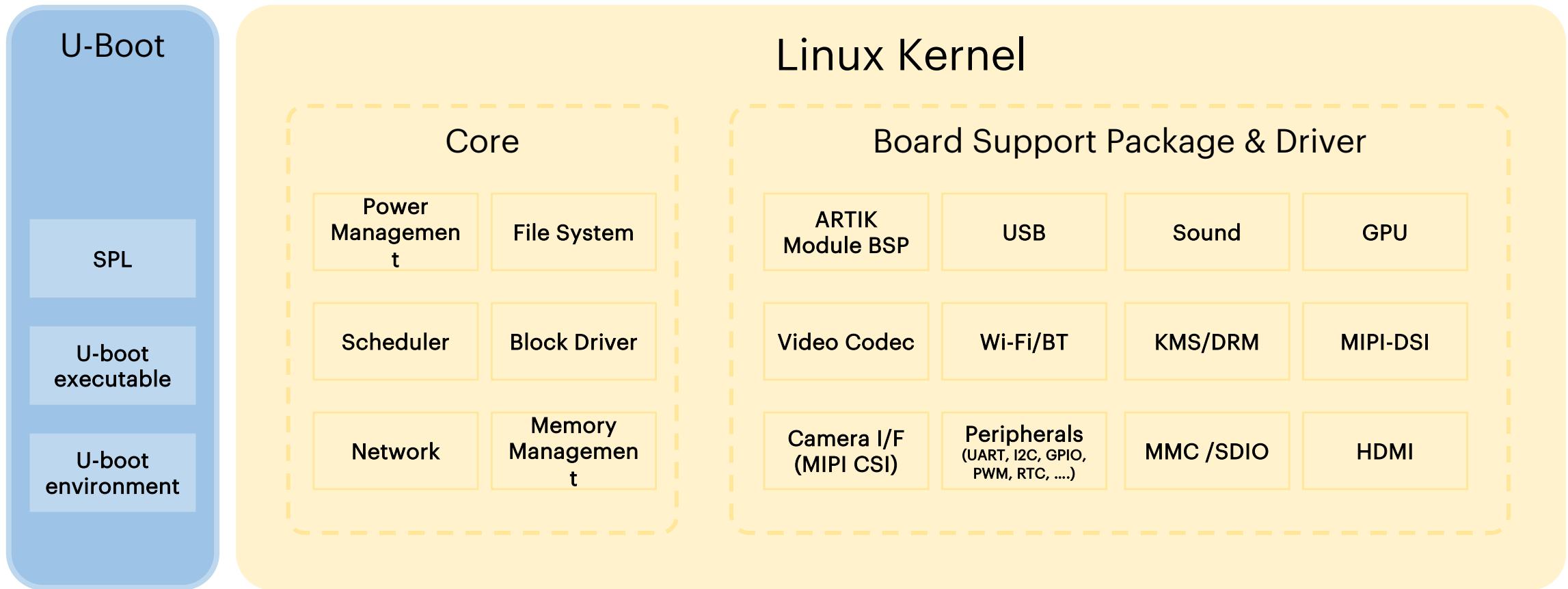
```
gst-launch-1.0 -e camerasrc camera-crop-width=1280 camera-crop-height=720 ! tee name=t \
t. ! queue ! nxvideoenc bitrate=12000000 ! queue ! mux. \
autoaudiosrc ! liveadder start-time-selection=2 start-time=600000000! lamemp3enc ! queue ! mux. \
t. ! nxvideosink \
mp4mux name=mux ! filesink location=result_a.mp4
```

# ARTIK Gateway Module Software Stack

# ARTIK Gateway Software Stack

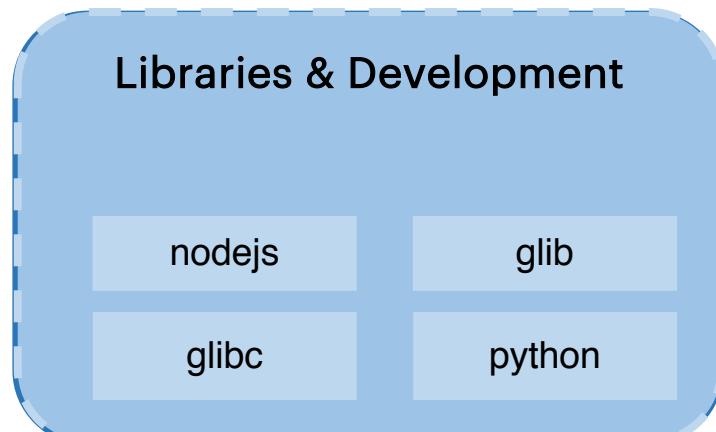
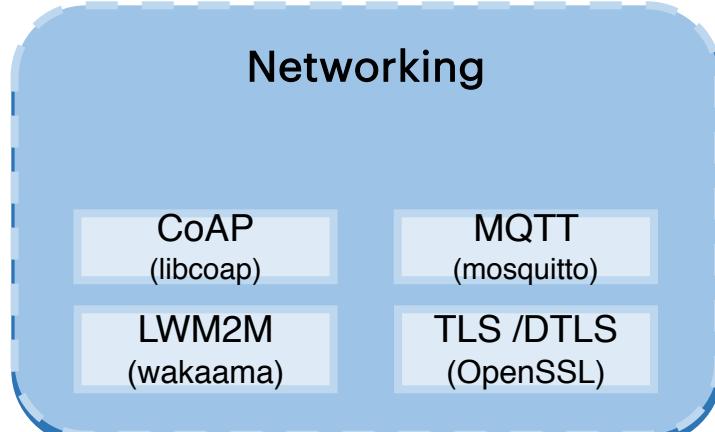
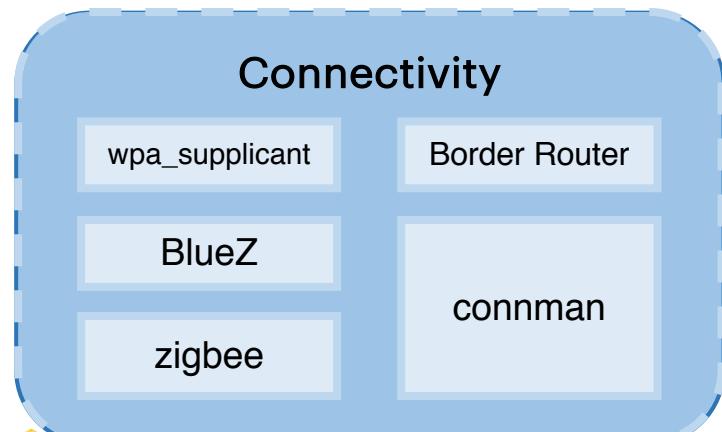
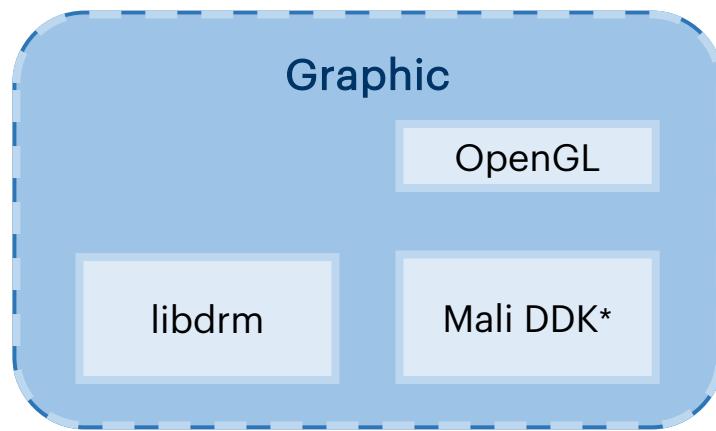
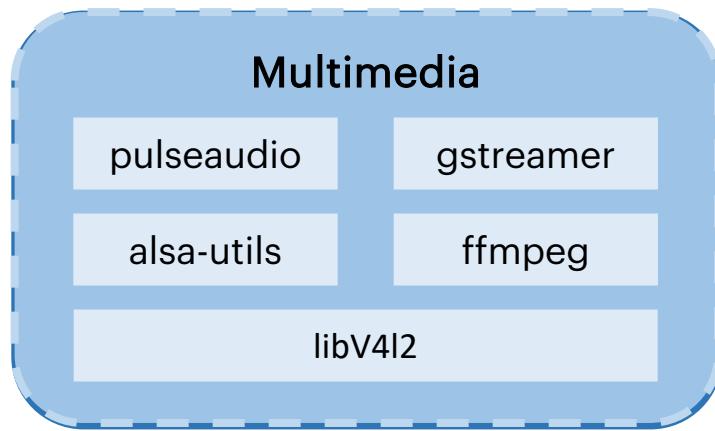
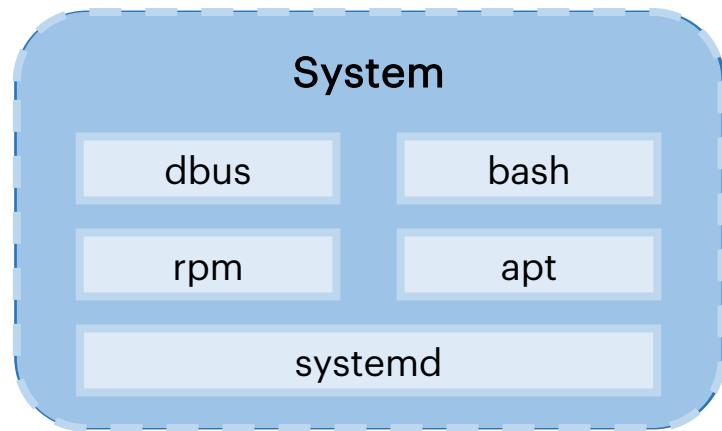


# U-Boot and Linux Kernel Architecture

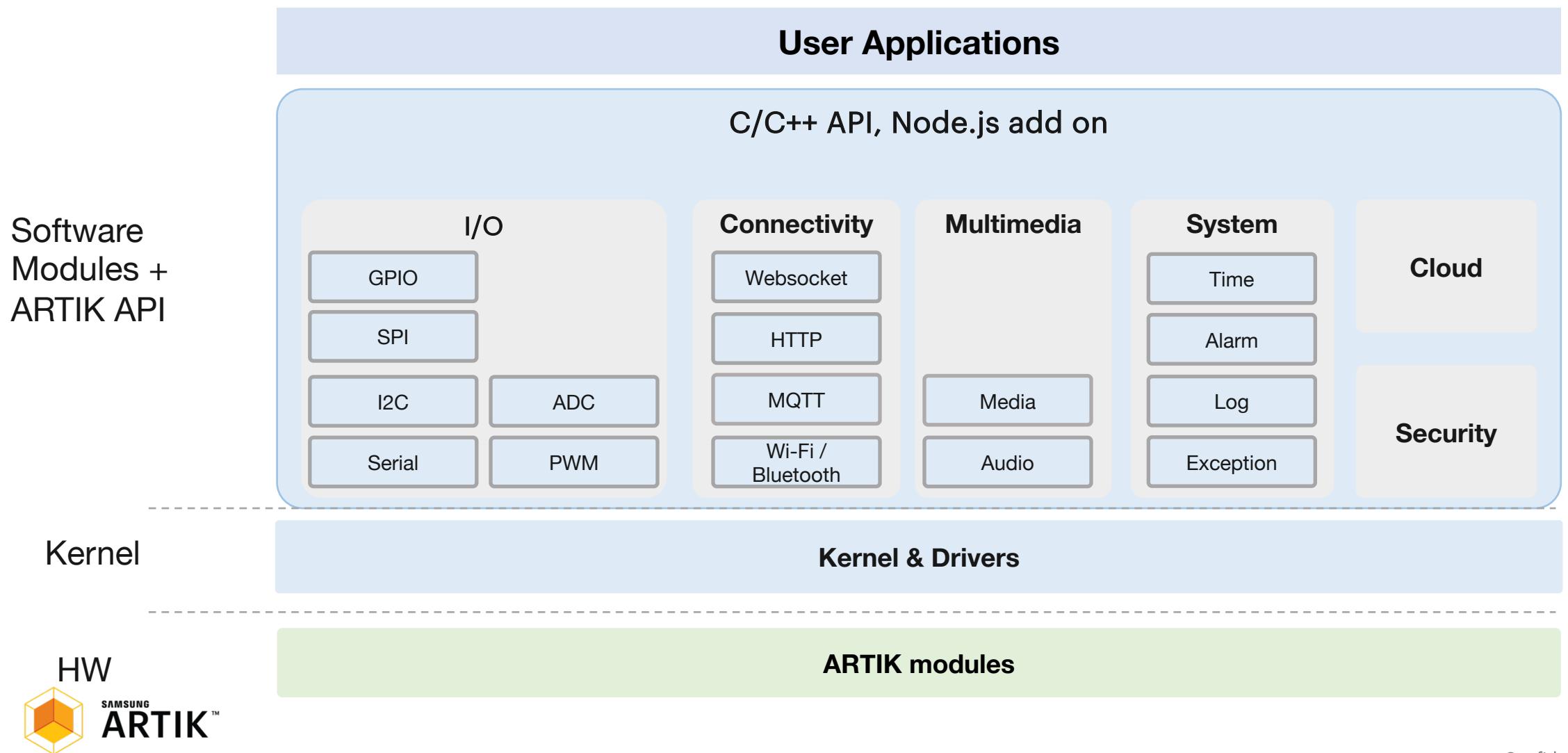


# Architecture of Rootfs

## Rootfs



# ARTIK SDK (5, 7 series)

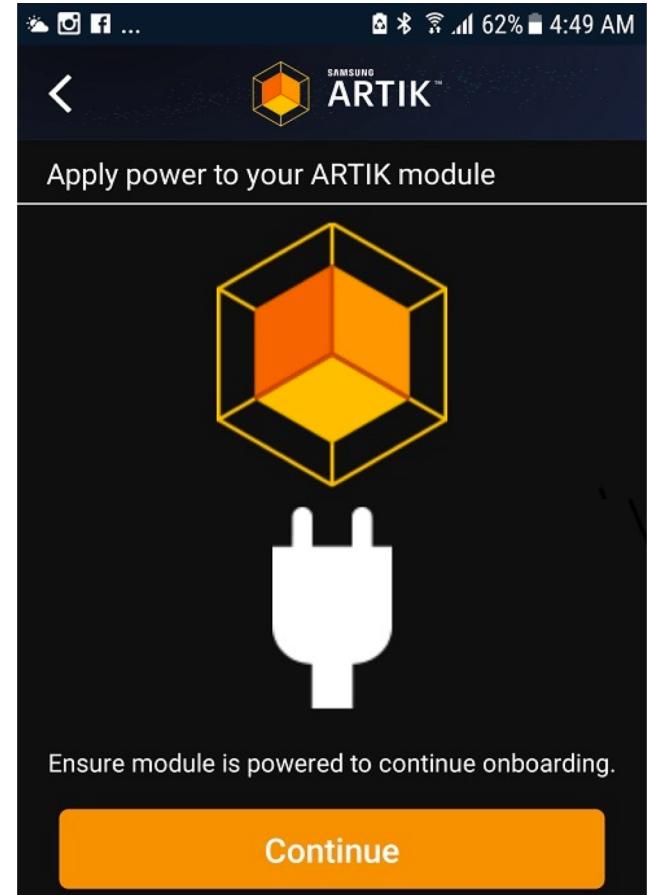
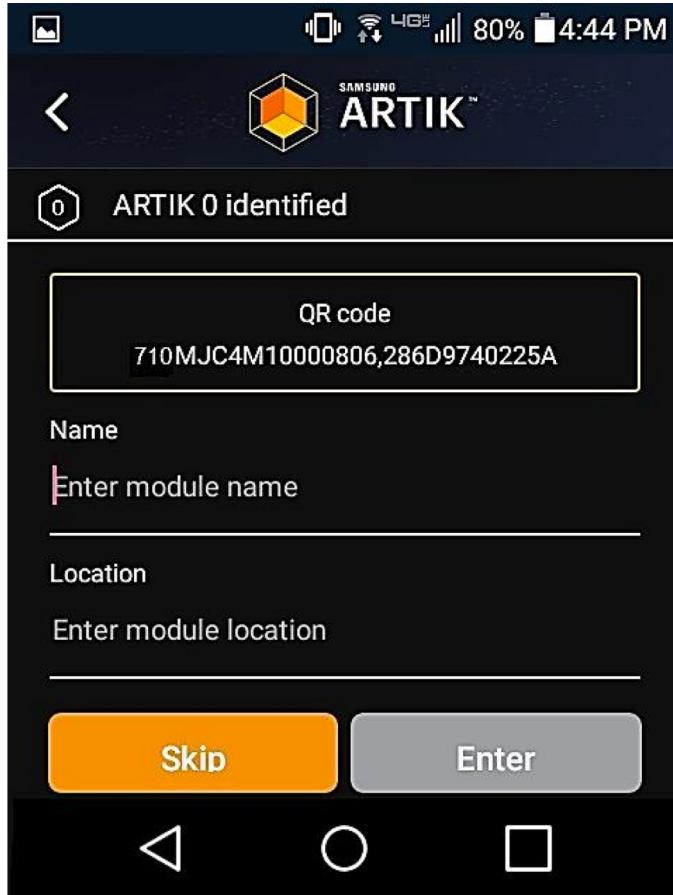
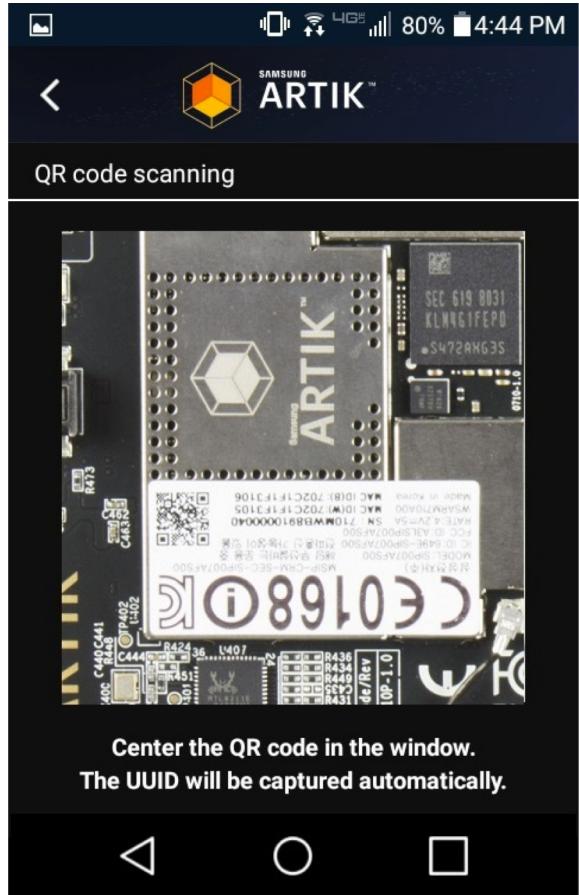


# ARTIK End-to-end solution

# ARTIK Gateway Onboarding

- Support BLE onboarding on Gateway modules
  - QR code contains device information like MAC address, through which the mobile app learns the BLE service UUID of the ARTIK controller.
  - Mobile App scans for BLE devices and matches the service UUID with the one from the QR code.
  - Connection Manager connects ARTIK Gateway to WiFi.
  - Mobile App interacts with BLE on-boarding service through BLE GATT profile.

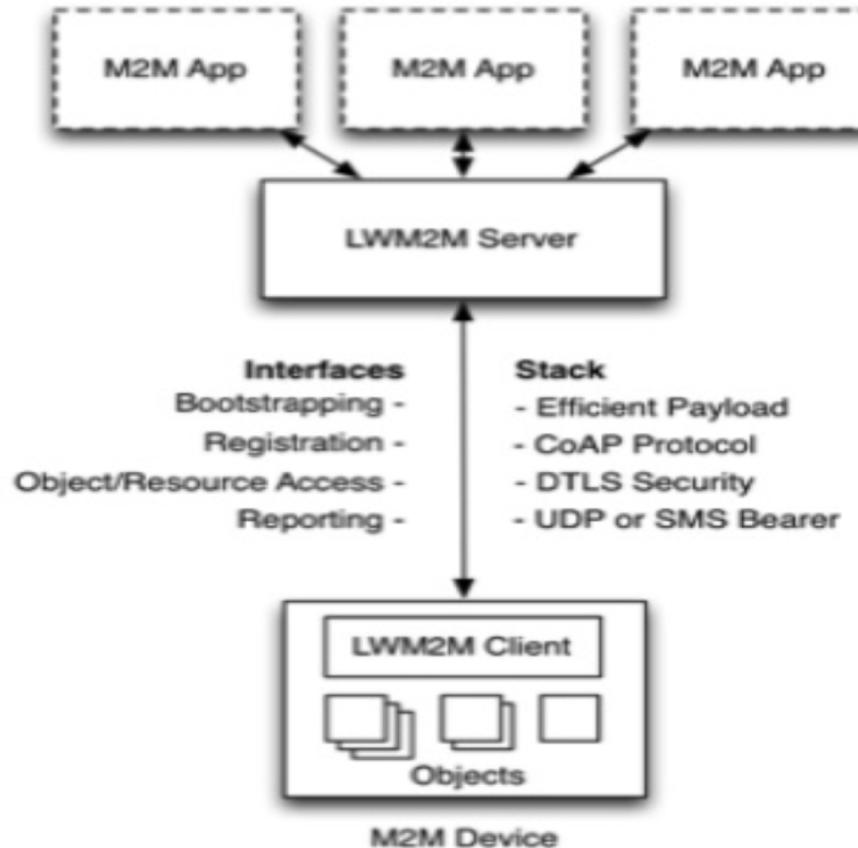
# Onboarding app



# Device Management and LWM2M stack

- Lightweight M2M (LWM2M) is a device lifecycle management specification
- Provides a specification for functions like: firmware upgrade, provisioning of certificates, access control policies, connectivity monitoring etc.
- Based on CoAP protocol (M2M protocol, runs over UDP, client/server model)
- LWM2M allows the use of UDP for communication between client and server
- DTLS security for communication between an LWM2M client and ARTIK Cloud server(an LWM2M server).

# LWM2M Architecture Overview



## LWM2M server

- Persistent endpoint through which devices and apps interact
- Deployable on gateways and/or in the cloud

## LWM2M client

- Hosts resources(objects) that represent a physical device

# Eclipse Wakaama



- Eclipse Wakaama is an open source implementation of the OMA LWM2M protocol in C language.
- Includes 3 layers: LWM2M Protocol, CoAP and DTLS layer.
- Implements LWM2M Client, LWM2M Server and LWM2M Bootstrap Server.



# Device Management

**Device Types**

Overview

ARTIK Smart Parking LED

ARTIK Smart Parking System

ARTIK Smart Trash Cans

ARTIK Toggle

ARTIK Trigger

ARTIK Utility Pole Sound Recognition

artik053

Philips Respironics

Set Up

Device Management

Properties

OTA Updates

Tasks

Monetization

Errors

Sprinkler

**Device Management / Properties**

Philips Respironics

Device Management / Properties

Organize and manage a fleet of devices with properties

**Server Properties**

Server properties can be custom-defined by you and are stored in ARTIK cloud services. You can create these at any time and assign per-device values that can be searched and indexed.

**ADD SERVER PROPERTIES**

**Device Properties**

EDIT

akc	Type
update	Boolean
device	Group
availablePowerSources	Long
batteryLevel	Long
batteryStatus	Long
currentTime	Long
deviceType	String
errorCode	Long
factoryReset	Boolean
firmwareVersion	String
hardwareVersion	String
manufacturer	String
memoryFree	Long
memoryTotal	Long
modelNumber	String

**Support**

**DEVICE TYPES**

NEW

Overview

ARTIK Smart Parking LED

ARTIK Smart Parking System

ARTIK Smart Trash Cans

ARTIK Toggle

ARTIK Trigger

ARTIK Utility Pole Sound Recognition

artik053

Set Up

Device Management

Properties

OTA Updates

Tasks

Monetization

Errors

Philips Respironics

Sprinkler

**Device Management**

artik053

Device Management

SEARCH FOR KNOWN DEVICES

Q

Selected 1 of 4 devices Select All

**EDIT** EXECUTE ▾ ROWS CARDS REFRESH LIST

DEVICE ID	SERIAL NUMBER	CREATED	CONNECTION STATUS	LAST CONNECTED
6941eac41a604a8a8a64a4fb2f7e5930	No Data	15/Nov/17 05:45 PM	Never connected	Never
f64ac03cbd414b28828b207e97e6b02c	No Data	23/Nov/17 02:05 AM	Never connected	Never
5a9c3df6af9448e683b864b189dc6990	No Data	14/Jan/18 09:30 PM	Never connected	Never
3d96739259dd4bb5b2f8dfc32817fe39	1234567890	Yesterday at 05:57 PM	Active (websocket)	04/Feb/18 07:59 PM

Showing 1 to 4 of 4 Devices

<< < 1 > >>

# Device Management

### Upload a New OTA Update Image

OTA-update-sample-app-1.2-0-armhf-signed.tar.xz (5.02 KB) [Delete](#)

**TYPE** Application

**VERSION** v1.2-0

**DESCRIPTION** Signed OTA application image

**UPLOAD**

### Step 1 of 2: Choose Image File

SEARCH FOR KNOWN OTA UPDATE IMAGES

FILE	UPDATE TYPE	VERSION	SIZE	UPLOAD TIME
ota-edge-node-a05x-v1.5.3.bin Image to be OTAed for Lab exercise	Edge Node	v1.5.3	567.87 KB	28/Ju/17 09:54 PM

Showing 1 to 1 of 1 OTA Update Images

**NEXT** **CANCEL**

### Step 2 of 2: Perform/Schedule Update

**Selected Image** ota-a05x-firmware-1.5.4.bin (568 KB) [CHANGE](#)

UPDATE TYPE	VERSION	UPLOAD TIME
Edge Node	1.5.4	19/Jun/17 10:47 AM

**Device** 1 Device in ARTIK 053

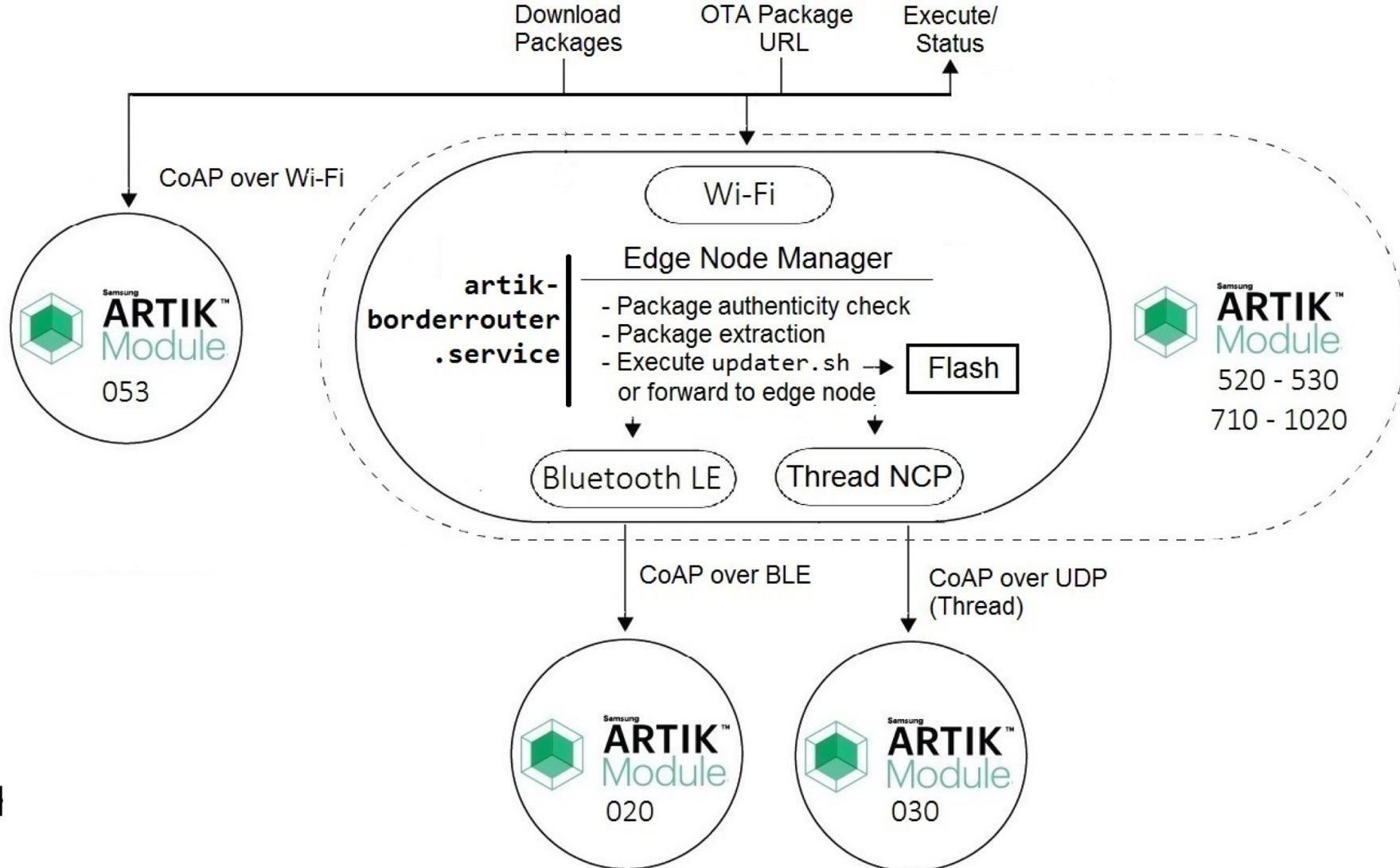
**Schedule (Optional)** Perform this OTA update with the selected image immediately, or specify a time to schedule for a time in the future.

**DATE & TIME** Select a date and time

**TIMEZONE** (UTC+01:00) Paris

**PERFORM OTA UPDATE** **CANCEL**

# Edge Node Manager



# Edge Node Manager Dashboard

The screenshot shows the ENM DASHBOARD interface. At the top, it displays the version information: Version 1.5.4, ENM up 17 minutes ago, and Platform up 17 minutes ago. The main area is a table listing detected devices. The columns are: DEVICE, UUID, STATE, OS, FIRMWARE VERSION, HARDWARE MODEL, CLOUD, DETAILS, and DELETE. Two devices are listed:

DEVICE	UUID	STATE	OS	FIRMWARE VERSION	HARDWARE MODEL	CLOUD	DETAILS	DELETE
Edge Node Manager - 192.168.1.103	d2dd0fd8-6764-418f-9a29-702c1f378685	Online	UNRELEASED	1.5.4-1	ARTIK530S	X		
marka020	d2dd0fd8-6764-418f-9a29-000b5727c0db	Online	3.5.2	1.0.3	ARTIK-020			

Below the table are buttons for Refresh, Auto-refresh Every 10 Seconds (unchecked), and a message indicating 2 Devices detected.

At the bottom, there are links for Home and Company, and a copyright notice: © 2017 Samsung ARTIK, The ARTIK End-to-end IoT Platform.

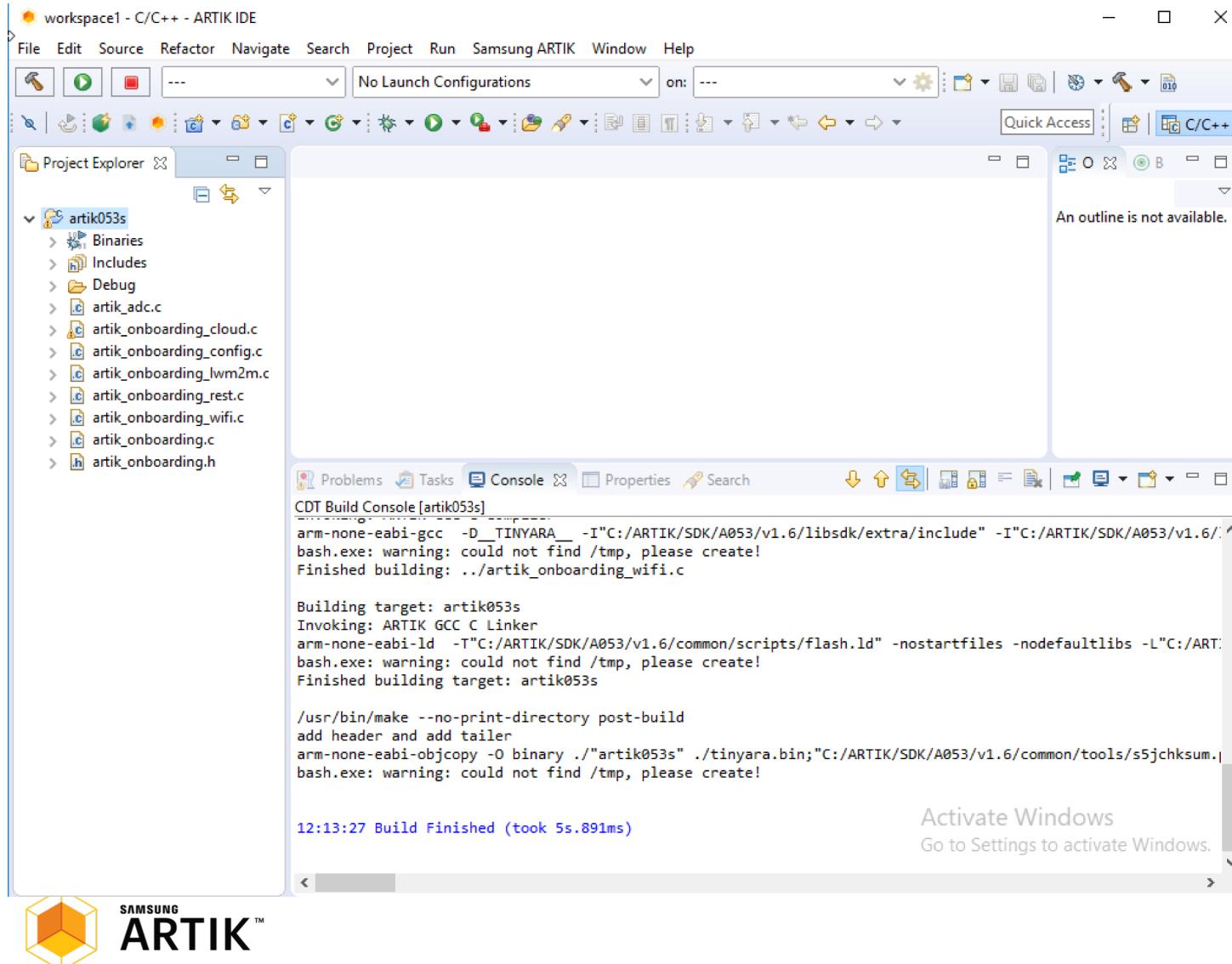
# Edge Node Manager Dashboard (Cont.)

The screenshot shows the ENM DASHBOARD configuration page for an ENM instance at 192.168.1.103. The dashboard header indicates Version 1.5.4, ENM up 9 minutes ago, and Platform up 10 minutes ago. The main content area is titled "Edge Node Manager Configuration Properties" and lists several configuration options:

- REST API \*** ENABLE OR DISABLE THE REST API MODULE (ON)
- DBUS API \*** ENABLE OR DISABLE THE DBUS API MODULE (OFF)
- DEBUG** ENABLE OR DISABLE THE DEBUG TRACES (OFF)
- LWM2M API \*** ENABLE OR DISABLE THE LWM2M API MODULE (ON)
- EVENTS API \*** ENABLE OR DISABLE THE EVENTS API MODULE (ON)
- DISCOVERY ENABLE ON STARTUP API** ENABLE OR DISABLE THE DISCOVERYENABLEONSTARTUP (ON)
- CLIENT ID**: client\_id
- DATABASE PATH \*** SPECIFIES THE DATABASE STORAGE PATH: /var/local/enmd.db

# ARTIK Gateway Module Development

# ARTIK IDE

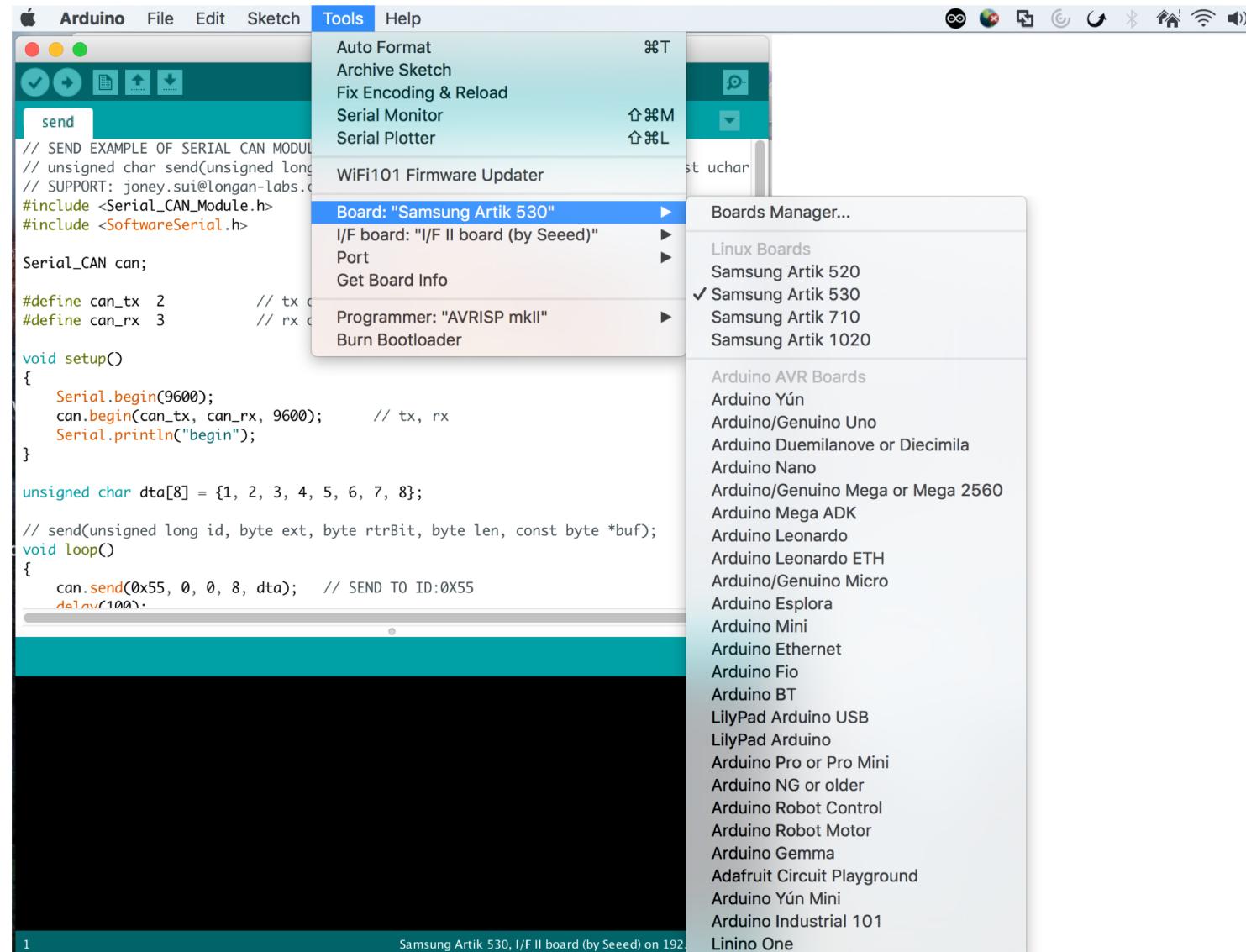


The screenshot shows the ARTIK IDE interface for a C/C++ workspace named "workspace1 - C/C++ - ARTIK IDE". The Project Explorer view on the left lists files under the "artik053s" project, including "Binaries", "Includes", "Debug", and several source files like "artik\_adc.c", "artik\_onboarding\_cloud.c", etc. The main workspace area displays the message "An outline is not available." Below the workspace are tabs for "Problems", "Tasks", "Console", "Properties", and "Search". The "Console" tab is active, showing the CDT Build Console output for the target "artik053s". The build log includes commands for compilation and linking using tools like arm-none-eabi-gcc and arm-none-eabi-ld, along with messages about bash.exe warning about /tmp. The build process is completed at 12:13:27. A watermark for "Activate Windows" is visible in the bottom right corner.



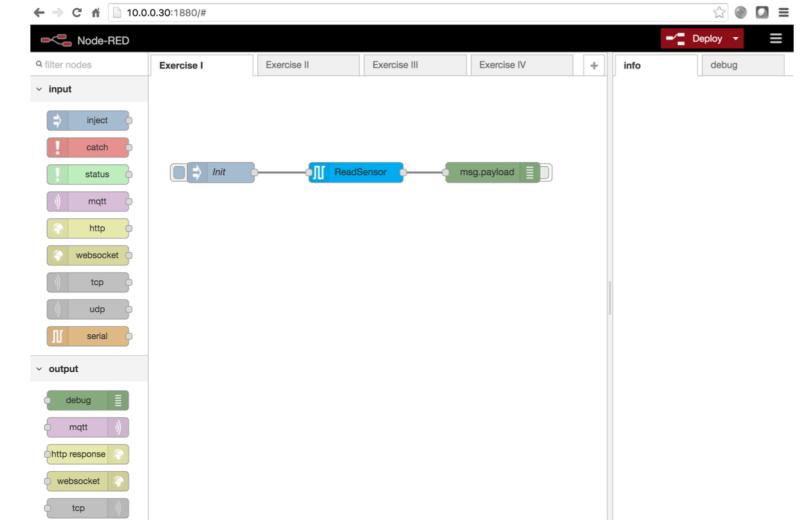
gcc-arm-linux-gnueabihf  
and  
aarch64-linux-gnu

# Arduino



# Node-RED

- A visual tool for wiring the internet of things, based on Node.js
- Utilizes flow programming technique
- Construct program flow by drag-and-drop
- You have the option not to write code
- Growing ecosystem
- Cloud-based solutions: IBM Bluemix, Front end Node-RED



# Native Development

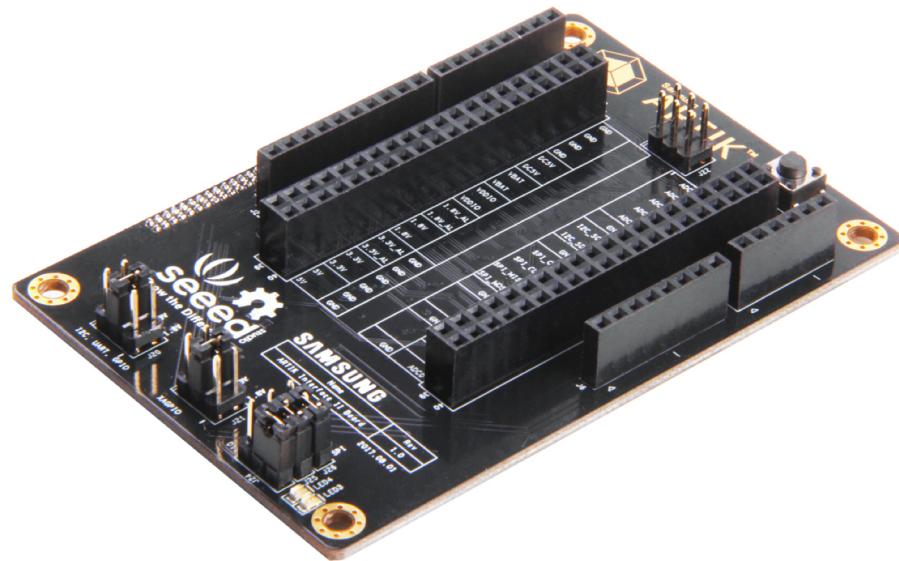
- C/C++: Most popular programming languages for embedded devices. e.g, ARTIK SDK
- Python: Rich libraries
- JS: Node.js is the most popular JavaScript runtime for high-end IoT devices.
- Java:

# 3<sup>rd</sup> party Libraries/APIs

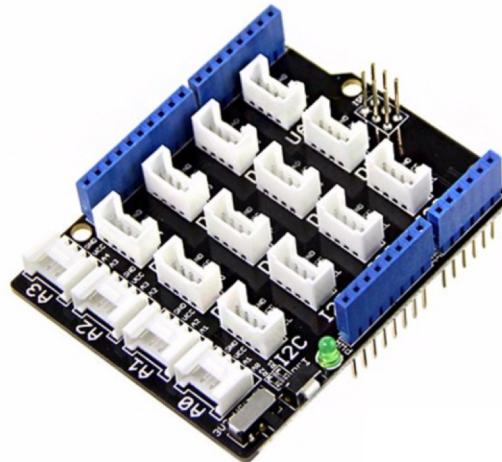
- Multimedia: PyAudio, OpenCV, Speech Recognition etc.
- Communication Protocols/Frameworks:
  - MQTT(Eclipse Mosquitto/Paho)
  - OPC-UA(Eclipse Milo, open62541)
  - LWM2M(Eclipse Wakama, Eclipse Leshan)

# ARTIK Gateway Module Ecosystem

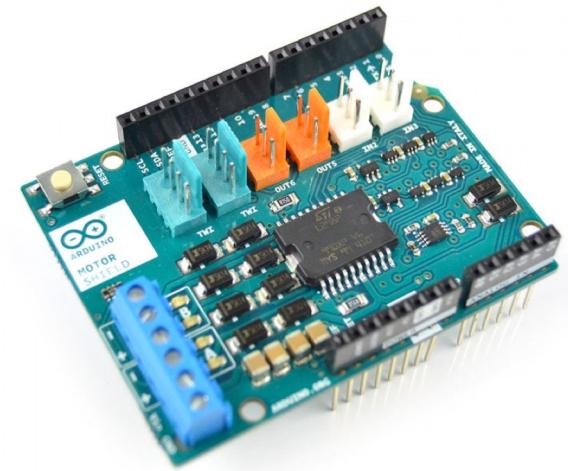
# Arduino Shields



Arduino IF II board



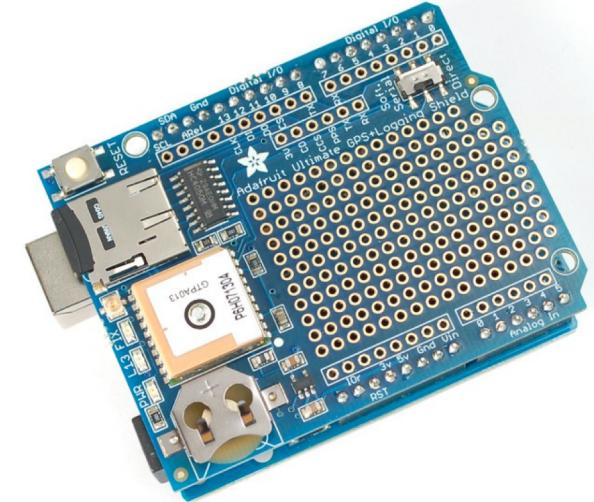
Base Shield



Motor Shield



Relay Shield



GPS Logger Shield

# Kitra GTI

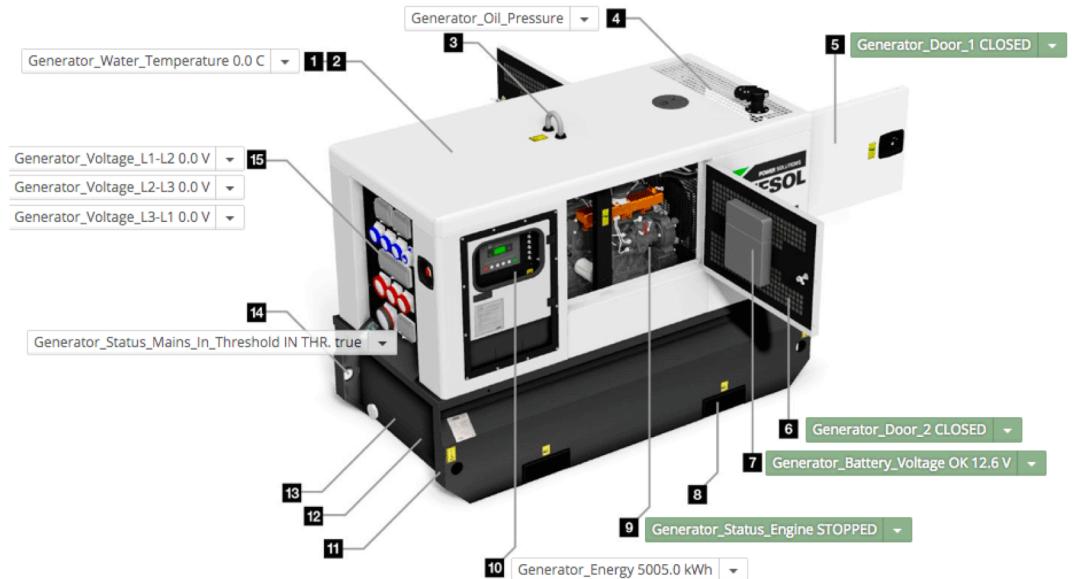
## ARTIK 710s

Use Kitra GTI as the Industrial IoT Gateway device

Use case: Industrial IoT Gateway device, hubs

Hardware: ARTIK 710S

Software: Based on your solution



# CAN Bus Solution for Access to Vehicle Data

## ARTIK 5x, ARTIK 7x SoMs

Use ARTIK 5x/7x for CAN bus communication.

**Use case:** Vehicle/boat diagnostic system

**Hardware:** ARTIK 5x/7x & interface board, Grove Base Shield, Serial CAN bus module

**Software:** libArduino for ARTIK 5x/7x



# Long-range Connectivity

## ARTIK 530s with Multi-tech

Provide LTE support on ARTIK 530s with Multi-tech modem and Twilio SIM. Send a text message to Twilio phone number and receive real-time readings from sensors attached to ARTIK 530s.

**Use case:** Smart city, remote data transmission and monitoring systems, freight management

**Hardware:** ARTIK 530s, Multi-tech modem, Twilio SIM card, (optional) screen LCD

**Software:** Twilio APIs, Qt for UI



# Facial Recognition Security Camera

## ARTIK 530s

Uses ARTIK 530s and camera accessories for facial recognition. Non-enrolled faces will trigger alerts. Motion detection and video capture can be enabled.

**Use case:** Home surveillance, access control system

**Hardware:** ARTIK 530s, OV5640 5M Auto Focus USB camera, 10.1" PCAP Touch Screen LCD, sensors

**Software:** OpenCV, Kairos face recognition APIs, Qt



# Voice Enablement

## ARTIK 530s SoM and Google Assistant

Run Google Assistant or Amazon AVS on ARTIK530s. Use voice commands to control peripherals or sensors attached to ARTIK.

**Use case:** Voice-controlled gateway, home and building products

**Hardware:** ARTIK 530s, speaker, (optional) LCD

**Software:** Google Assistant SDK or Alexa Voice Service Device SDK. Can develop additional Google Actions or Alexa skills to extend basic capabilities.



# Machine Learning Inference

## ARTIK 710

Run Machine Learning Inference on ARTIK 710

**Use case:** Smart Factory, Smart Building etc.

**Hardware:** ARTIK 710(s)

**Software:** Tensor Flow trained model; AWS Greengrass ML  
Inference



# 3<sup>rd</sup> party Frameworks, Solutions

Gateway Solutions:



Communication Protocols/Frameworks:



- Datasheets
- User-guides
- Schematics
- PCB layout
- BOM
- Firmware
- Tools

Samsung ARTIK Internet Secure | https://www.artik.io

**SAMSUNG ARTIK™** Overview Products Resources Partners Contact News Log Out

Your fastest path to the Internet of Things

Samsung ARTIK™ is the integrated Smart IoT platform providing the fastest path to secure, interoperable, and intelligent IoT products and services.

Watch the video Learn more

Introducing ARTIK 530

Higher power, lower cost module for multimedia and gateway devices.

See the specs >

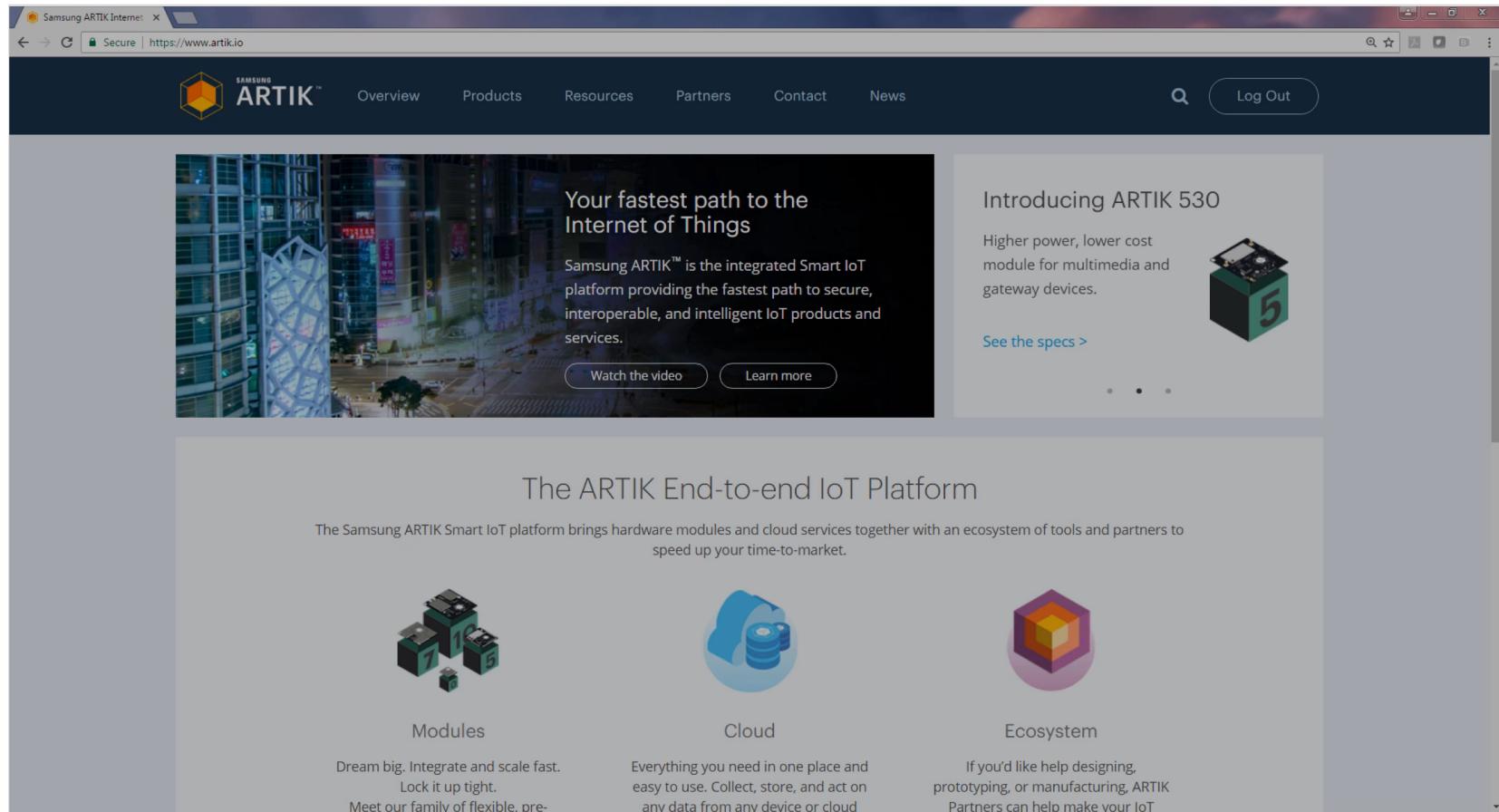
The ARTIK End-to-end IoT Platform

The Samsung ARTIK Smart IoT platform brings hardware modules and cloud services together with an ecosystem of tools and partners to speed up your time-to-market.

**Modules**  
Dream big. Integrate and scale fast.  
Lock it up tight.  
Meet our family of flexible, pre-

**Cloud**  
Everything you need in one place and easy to use. Collect, store, and act on any data from any device or cloud

**Ecosystem**  
If you'd like help designing, prototyping, or manufacturing, ARTIK Partners can help make your IoT





Samsung ARTIK Internet x https://www.artik.io

SAMSUNG ARTIK™ Overview Products Resources Partners Contact News Log Out

Your fastest path to the Internet of Things

Samsung ARTIK™ is the integrated Smart IoT platform providing the fastest path to secure, interoperable, and intelligent IoT products and services.

Watch the video Learn more

Certified Partners

Get to market even faster with Certified ARTIK Partners.

Partner directory >

The ARTIK End-to-end IoT Platform

The Samsung ARTIK Smart IoT platform brings hardware modules and cloud services together with an ecosystem of tools and partners to speed up your time-to-market.

Modules

Dream big. Integrate and scale fast.  
Lock it up tight.  
Meet our family of flexible, pre-

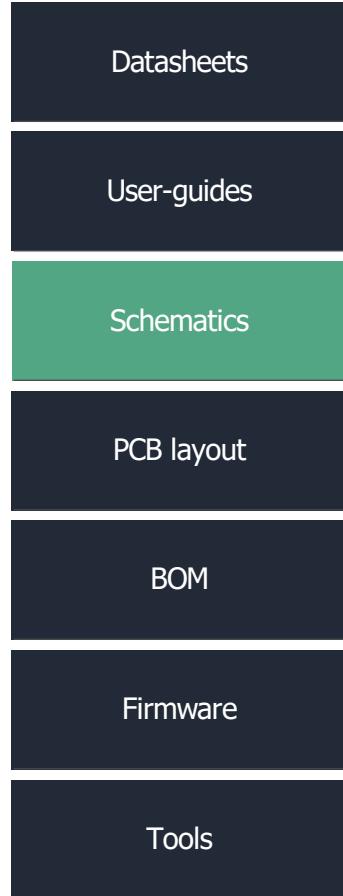
Cloud

Everything you need in one place and easy to use. Collect, store, and act on any data from any device or cloud

Ecosystem

If you'd like help designing, prototyping, or manufacturing, ARTIK Partners can help make your IoT

The screenshot shows the Samsung ARTIK website at https://www.artik.io. The top navigation bar includes links for Overview, Products, Resources, Partners, Contact, News, a search icon, and a Log Out button. A large banner on the left features a night cityscape and the text "Your fastest path to the Internet of Things". Below the banner, a section titled "The ARTIK End-to-end IoT Platform" describes the integration of hardware modules and cloud services. Three main components are highlighted: "Modules" (represented by a stack of green and blue cubes), "Cloud" (represented by a blue circular icon with data points), and "Ecosystem" (represented by a purple hexagonal icon). To the right of these components, there's a "Certified Partners" section with a call to action to get to market faster. At the bottom of the page, there's a footer with social media icons and a "Contact Us" button.



Samsung ARTIK Internet x https://www.artik.io

**SAMSUNG ARTIK™** Overview Products Resources Partners Contact News Log Out

Your fastest path to the Internet of Things

Samsung ARTIK™ is the integrated Smart IoT platform providing the fastest path to secure, interoperable, and intelligent IoT products and services.

Watch the video Learn more

Certified Partners

Get to market even faster with Certified ARTIK Partners.

Partner directory >

The ARTIK End-to-end IoT Platform

The Samsung ARTIK Smart IoT platform brings hardware modules and cloud services together with an ecosystem of tools and partners to speed up your time-to-market.

**Modules**

Dream big. Integrate and scale fast.  
Lock it up tight.  
Meet our family of flexible, pre-

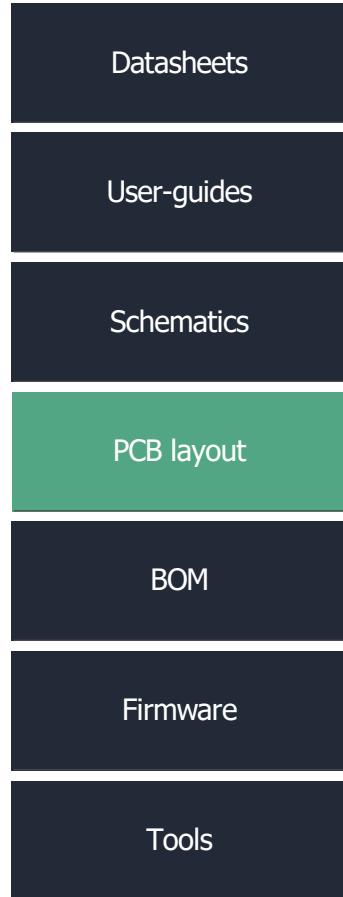
**Cloud**

Everything you need in one place and easy to use. Collect, store, and act on any data from any device or cloud

**Ecosystem**

If you'd like help designing, prototyping, or manufacturing, ARTIK Partners can help make your IoT

This screenshot shows the Samsung ARTIK website. The top navigation bar includes links for Overview, Products, Resources, Partners, Contact, News, a search icon, and a Log Out button. A banner at the top features a cityscape and the text "Your fastest path to the Internet of Things". Below the banner, a section titled "Certified Partners" is shown with the subtext "Get to market even faster with Certified ARTIK Partners" and a "Partner directory >" link. The main content area is titled "The ARTIK End-to-end IoT Platform" and describes how the Samsung ARTIK Smart IoT platform integrates hardware modules and cloud services. It highlights three main components: Modules (represented by a stack of green and blue cubes), Cloud (represented by a blue globe icon), and Ecosystem (represented by a purple cube icon). The Ecosystem section includes a callout for ARTIK Partners to help with design, prototyping, and manufacturing.



Samsung ARTIK Internet x https://www.artik.io

**SAMSUNG ARTIK™** Overview Products Resources Partners Contact News Log Out

Your fastest path to the Internet of Things

Samsung ARTIK™ is the integrated Smart IoT platform providing the fastest path to secure, interoperable, and intelligent IoT products and services.

Watch the video Learn more

Certified Partners

Get to market even faster with Certified ARTIK Partners.

Partner directory >

The ARTIK End-to-end IoT Platform

The Samsung ARTIK Smart IoT platform brings hardware modules and cloud services together with an ecosystem of tools and partners to speed up your time-to-market.

**Modules**

Dream big. Integrate and scale fast.  
Lock it up tight.  
Meet our family of flexible, pre-

**Cloud**

Everything you need in one place and easy to use. Collect, store, and act on any data from any device or cloud

**Ecosystem**

If you'd like help designing, prototyping, or manufacturing, ARTIK Partners can help make your IoT



The screenshot shows the Samsung ARTIK website homepage. The header includes the ARTIK logo, navigation links for Overview, Products, Resources, Partners, Contact, and News, a search icon, and a Log Out button. The main content features a banner with the text "Your fastest path to the Internet of Things" and a description of the ARTIK platform. Below the banner, there's a section titled "The ARTIK End-to-end IoT Platform" with three categories: Modules, Cloud, and Ecosystem. Each category has an icon and a brief description.

**ARTIK™**

Overview Products Resources Partners Contact News

Datasheets User-guides Schematics PCB layout BOM Firmware Tools

Your fastest path to the Internet of Things

Samsung ARTIK™ is the integrated Smart IoT platform providing the fastest path to secure, interoperable, and intelligent IoT products and services.

Watch the video Learn more

Certified Partners

Get to market even faster with Certified ARTIK Partners.

Partner directory >

The ARTIK End-to-end IoT Platform

The Samsung ARTIK Smart IoT platform brings hardware modules and cloud services together with an ecosystem of tools and partners to speed up your time-to-market.

**Modules**

Dream big. Integrate and scale fast.  
Lock it up tight.  
Meet our family of flexible, pre-

**Cloud**

Everything you need in one place and easy to use. Collect, store, and act on any data from any device or cloud

**Ecosystem**

If you'd like help designing, prototyping, or manufacturing, ARTIK Partners can help make your IoT



Samsung ARTIK Internet Secure | https://www.artik.io

**SAMSUNG ARTIK™** Overview Products Resources Partners Contact News Log Out

Your fastest path to the Internet of Things

Samsung ARTIK™ is the integrated Smart IoT platform providing the fastest path to secure, interoperable, and intelligent IoT products and services.

Watch the video Learn more

Certified Partners

Get to market even faster with Certified ARTIK Partners.

[Partner directory >](#)

The ARTIK End-to-end IoT Platform

The Samsung ARTIK Smart IoT platform brings hardware modules and cloud services together with an ecosystem of tools and partners to speed up your time-to-market.

**Modules**  
Dream big. Integrate and scale fast.  
Lock it up tight.  
Meet our family of flexible, pre-

**Cloud**  
Everything you need in one place and easy to use. Collect, store, and act on any data from any device or cloud

**Ecosystem**  
If you'd like help designing, prototyping, or manufacturing, ARTIK Partners can help make your IoT



Samsung ARTIK Internet | https://www.artik.io

**SAMSUNG ARTIK™**

Overview Products Resources Partners Contact News

Log Out

Your fastest path to the Internet of Things

Samsung ARTIK™ is the integrated Smart IoT platform providing the fastest path to secure, interoperable, and intelligent IoT products and services.

Watch the video Learn more

Smart Lighting eBook

Don't create smart lighting solutions in the dark. Our new eBook asks 7 key questions.

Learn more >

The ARTIK End-to-end IoT Platform

The Samsung ARTIK Smart IoT platform brings hardware modules and cloud services together with an ecosystem of tools and partners to speed up your time-to-market.

Modules

Dream big. Integrate and scale fast.  
Lock it up tight.  
Meet our family of flexible, pre-

Cloud

Everything you need in one place and easy to use. Collect, store, and act on any data from any device or cloud

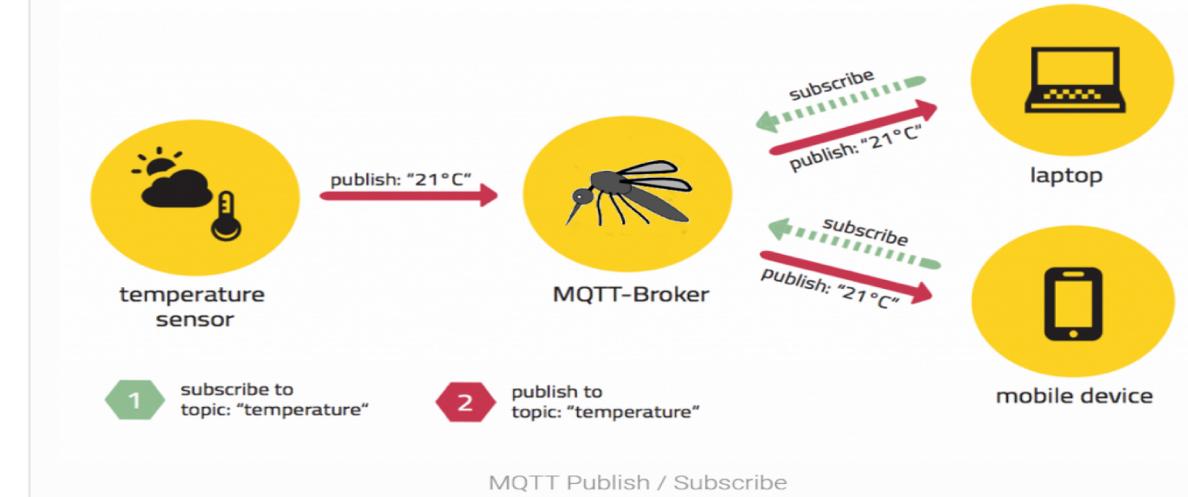
Ecosystem

If you'd like help designing, prototyping, or manufacturing, ARTIK Partners can help make your IoT

# APPENDIX

# Message Queue Telemetry Transport (MQTT)

- MQTT history
- Light-weight messaging protocol, rides on TCP
- Broker / Clients architecture
- Publication / Subscription messaging model
- No pre-defined format for payload



# Message Queue Telemetry Transport (MQTT)

- In general, a MQTT client can be both a publisher & subscriber at the same time
- A MQTT client can run on any device from a micro controller up to a server. MQTT C client code only takes 30KB, Java code is about 100KB.
- MQTT client libraries are available for a huge variety of programming languages, e.g, C/C++, Arduino, Java, JavaScript, Android, iOS, C#, .NET

<https://github.com/mqtt/mqtt.github.io/wiki/libraries>

- MQTT client: Eclipse Paho



MQTT.fx (available for Win/MacOS/Linux) etc.

# Message Queue Telemetry Transport (MQTT)

- MQTT Broker is responsible for receiving all messages, filtering them, and sending the messages to all subscribed clients.
- It holds the session of all persistent clients including subscriptions and missed messages
- Authentication and authorization of clients.
- Self Hosted MQTT brokers:

Eclipse Mosquitto



HiveMQ(licensed)



- Cloud based MQTT brokers:

AWS



IBM Bluemix



HiveMQ ([broker.hivemq.com](http://broker.hivemq.com))



Microsoft Azure



Eclipse Mosquitto ([test.mosquitto.org](http://test.mosquitto.org))



# CoAP

- Similar to HTTP, but designed for the needs of constrained devices
- Runs over UDP
- Client/server model
- Supports resource discovery
- Supported by ARTIK Cloud service

